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THE FOREST PEOPLE OF BRITISH GUIANA. *

BY

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2.—THE INDIANS.

The Guiana Indian is a fit denizen of the lonely forests and creeks in which he lives his quiet life. His colour is brown as the coffee-like waters on which he paddles his canoe; it harmonises also with the rich humus over which he glides and the tree-trunks that support the green forest roof. His clothing consists only of a blue loin-cloth or lap, and in the case of the woman of a pretty bead apron; their colours hardly make any impression. If protective coloration is a fact, of which there appears to be no doubt, then the Indian of South America is as well fitted to his habitat as the wild animals are to theirs.

Now and again you meet a party in town obviously unfitted to such an environment. They walk along the streets one behind another, perhaps headed by one with a tall hat above his brown body, naked save for the inch or two of lap. Nigro boys jeer at them from a distance, and the clerks in the stores look at the women and smile at each other. The party march into a store, they look around, enquire the price of the article they want if it is visible, if not, go on farther. The salesmen call the men "Master John" and the women "Miss Mary," or else use the word "*Moi*" (brother); but hardly any one cares to pick up even a few words of their language. All trading is done by signs, and if you buy any curios you must offer money, a shilling at a time, until the seller is content with the number.

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At home, however, the Indian is obviously in his element. I have slept under their benabs many times and have always felt comfortable. Everything there is at your disposal, and, unlike some other native races, they do not pilfer. Such a crime as theft is quite unknown among them; you cannot steal from them, nor they from you. As, however, you need not hesitate to take or use whatever is at hand, you must expect that they will at least examine your belongings. Take this in good part and you will never have any trouble.

I recall with pleasure one of my trips to an Indian settlement which is now deserted and its site almost unapproachable. For six hours I had paddled up stream and was almost worn out as I entered the little branch of the creek where lay a dug-out and two woodskins. I pushed my bateau as near as the shallow water would permit, and by means of one of the canoes got ashore dryshod.

Before me was a low bank, up which went a narrow path wet with the trickle of water oozing from the sparkling white sand and bordered with moss. No person was to be seen, nor until I reached the top was there any sign of man's presence. Here, however, a benab or palm-roofed shed came in sight, and I was greeted by the barking of a dog—a tiny creature made up of skin and bones. Inside the benab sat an old, old woman weaving a cotton hammock, but she took no notice of my arrival. The bobbin went in and out among the network, and even when I spoke she only pointed to the bush track behind, meaning, as I supposed, that the other people were gone that way.

Getting nothing more from her, I took my way through the path which led over the reef for half a mile, and then suddenly dipped to a lower level. Here I came upon the provision ground of the settlement, in which half a dozen women and girls, with one boy, were working. The boy knew enough English to understand that I was come to spend the night with them, and they all seemed pleased, in their quiet way, when they understood.

While they were digging up cassava and chopping down weeds—cutlasses their only implement—I strolled over the place, which was about an acre in extent. The soil was a yellowish sandy marl, rather wet from the ooze from the sand-reef, which added to its fertility. Surrounded by the high woods, of which it had evidently formed a part barely a year ago, it was something entirely different to what is generally understood by a field. True, there was a hedge; but what a tall one! Towering to a height of eighty to a hundred feet, and festooned with creepers, it reminded me somewhat of the interior

of some ruined castle hung with trailing ivy. There were no beds, no drains, no paths. Scattered in every direction lay the charred trunks of the forest giants which once occupied the space. Some were piled one above another to a height of eight to twelve feet. Here and there were a few square feet of soil, and in these spaces the cassava was growing. Already, however, the great trunks were being broken up by wood-ants, and as I walked along them—the only way of inspecting the field—they crunched under my feet. Once I sunk three feet among the ruins of what had probably been a decayed trunk before its fall.

Everywhere there were weeds. They crawled from the border of the clearing in the shape of scrambling creepers, pushed themselves through between the dead logs, and fought with each other and the cassava plants for room to live. The women chopped away a few, but no doubt they had long learned how difficult was the task of keeping them down altogether.

Presently the loaded "wieries" were taken up, and one woman after another filed off for the benab with her load of cassava. I could not but sympathise with them, although, probably, they thought this tight band across the forehead and a load of fifty pounds on the bent back of little consequence. At first sight it looked as if the band would make a weal, but as the women bent forward I could see that there was but little strain on the head.

I followed them with the boy, who, man-like, carried no load. We talked about hunting and fishing as well as we could, but his vocabulary of English was very small. Labbas and acouries were common; now and then an ant bear or howling monkey was shot, and parrots came to certain trees every morning.

Arrived at the benab, he brought out his bow, and, as the starved apology for a dog was wandering about, he let fly with a blunt-headed arrow and gave the poor creature a severe poke between the ribs. I knew it was useless to speak of cruelty to this budding huntsman, for if he understood my words his mind could not take in their meaning. Then he took me down the hill to show me his own special woodskin, which his father had made for him, and the pretty ornamental paddle, which just fitted his little hands.

Again in the benab, I hung my hammock where there was plenty of room and sat down. The women were now busy. One fanned the smouldering logs until they blazed up, put on the pepper pot, and laid some cakes of cassava bread to toast, while the others commenced to grate the roots they had just brought in. The boy offered me the pepper pot, but I shook my head, and pointed to a

joint of barbecued labba which hung to the rafters. Indian stew with cassareep and peppers (capsicums) is undoubtedly very nice, but after what the boy had said about monkeys I was suspicious. The fingers of these creatures are sufficiently like those of a human baby to spoil the best civilized appetite. Fortunately there were no drinks ready, or I might have given offence by refusing a calabash of piwarree or casseerie. When it is understood that these are prepared mainly by chewing cassava bread and roots and spitting the mess into vessels with water, every one but an Indian will understand why they would be rejected.

The process of preparing cassava bread is very ingenious yet at the same time simple. After grating on a board studded with broken quartz, the pulp, which is a virulent poison, is placed in a long wicker strainer, probably suggested by the muscular construction of a snake. By pressing down the "matapee" it is shortened and filled, then it is hung up and a weight put upon the lower part, which draws it out to double the length and at the same time presses out the juice. By evaporation the juice becomes cassareep and the pulp the material for cassava bread; in both cases the poison is eliminated by the cooking. The bread is like flat pancakes and is baked upon circular dishes, once of stone or pottery, now of iron. When freshly toasted it has a nutty flavour, but otherwise it is tough and comparable to pressed sawdust.

Having enjoyed my dinner, I took a walk round the benab. The place was too barren for food plants, but there was quite a large patch of red lilies (*Hippeastrum equestre*), and on the slope grew quite a collection of ornamental foliage plants (*Caladiums*). These beenas, as they are called, are found everywhere about the Indian settlements, and are used as charms to promote success in hunting. The suffused crimson caladium, so well known in English conservatories, is used by the tiger (jaguar) hunter. To be successful, he must make several cuts on his breast or arms and rub the acrid juice of the tuber into the wounds. Other varieties are used in a similar way, each for its own particular species of game.

Presently the men came in from hunting, one carrying an ant bear and another a labba. They took little notice of my presence, handed the game to the women, and then threw themselves into their hammocks. I tried to speak to them, but no one knew English, and nothing was left, therefore, but to remain quiet.

As night fell the women also left their work and lay down just as they were. There was no undressing, and therefore nothing to shock the feelings. I could not but notice that, although almost

naked, they were quite modest in their ways. Of course it was dark under the benab, for it was only slightly lit by the glow of the wood fire at one end. Now and then a few words were spoken by one to another, but there was nothing like the chattering that goes on when two or three negroes get together at night.

Soon all was quite still. Only the hum of insect life could be heard, the everlasting voice of the tropical night.

I slept soundly, and woke at daybreak to find that the men were up and ready to go out. Spring hooks had been placed at different places in the creek, and they were going to see what had been caught. Feeling interested in their work, I took my bateau and followed, but with all my efforts was soon left far behind. Other objects, however, soon interested me; orchids were plentiful, and made me almost forget my Indian friends. Should I remain longer or go down to the mouth of the creek, where my stock of provisions and other necessaries were? The creature comforts turned the scale; I missed my morning coffee, and was soon paddling down stream.

It had been hard work against the stream; now it was correspondingly easy. The tide was running out at the mouth of the creek, and, as I got near, the bateau rushed along at a glorious pace. Yet there was an element of danger, for on the bottom lay hundreds of fallen logs—tacoubas, as they are called—smooth as boulders and almost as hard. Round each bend I rushed, eyes in front and hands rigid, to keep her head from splitting on these snags. Fortunately, I succeeded without mishap, and was soon inside a troolie hut enjoying my breakfast.

There may be a certain pleasure in companionship on such excursions, but, after all, close observations of nature cannot be carried out when there is a large company. Rarely indeed can you find one congenial friend; they are sportsmen, photographers, or, more generally, simply young fellows on the spree.

On one occasion I went with a party of a dozen in a steam launch to visit an Indian Mission on Masaruni river. We started on Saturday evening from Georgetown, and almost immediately, instead of trying to sleep, most of them took to drinking. By midnight they were quieter, for their potations were producing the natural effect, and I went to sleep to the churning of the screw.

Early on Sunday morning we arrived at Bartica, now an important little town as a starting-point for the gold diggings, but then a very small village, mostly peopled by bovianders. We walked about here for an hour or two and then went on, arriving at the

Indian Mission about noon. The landing was occupied by about a score of dug-outs and woodskins of all sizes, from that just suited to a child to those that, in quiet water, would carry a dozen persons.

Not a single person was to be seen anywhere; and when we got up the slope the reason was obvious. They were all in the church —an open shed with its palm thatch sloping down to about six feet from the ground at the sides. From within came the voice of the preacher. I advised my companions not to go near, for fear of disturbing the congregation.

This did not suit them; they wanted to see an Indian religious service. Far from their ideas, however, was anything like a quiet entrance of the church. No; they must stand up at one of the open sides and draw attention from the preacher. I fancy he must have hurried to close the service, for very shortly the Indians came forth, followed immediately by the person in question—a black catechist. At once he broke forth with a volley of remonstrances mingled with abuse. What were they doing there on the Sabbath disturbing the poor Indians? They ought to be ashamed of themselves. Their skins were white but their hearts were black (of course he transposed two of these words for his own case).

To tell the truth, I was ashamed of their manners, and went off into the forest, where, quite alone with nature, I enjoyed an hour's quiet walk. Returning with several new plants, I found that my companions had quite demoralized the place. It is true that many of the Indians had left in their canoes, but there still remained those who lived at the Mission and some of their friends. To make some of these drunk and to watch their behaviour in such a condition seemed to be the aim of one or two of my companions. They were out for a spree and must make the best of it according to their ideas. But what was play to them was death to these people, and, knowing the probable result, I tried to reason with the tempters. As might be expected, this was useless, and I again went into the bush until the steamer signalled for our departure.

I believe the Mission station referred to is now abandoned. What has become of the Indians it is hard to tell. Some, probably, have died from rum given them by gold diggers, others are dispersed in many directions. Every year they become fewer and fewer, and unless they can be kept away from the white man and his drink they must ultimately die out altogether.

3.—Chinese and East Indians.

Besides the bucks and bovianders we find a few Chinese and

East Indians in the Guiana forest. These people were originally introduced to the colony as indentured coolies, and, having worked for five years on the plantations, became free to settle where they chose.

The Chinese never relished the work of the cane-field, although some of them make fairly good agriculturists when working on their own account. What they like is shopkeeping, and in the towns and villages they compete with the Madeiran. The opium traffic is naturally under their control, but here and there they own rum-shops, and among the bovianders they are almost the only shop-keepers.

The opium trade is one from which the Colonial Government derives a fair revenue, notwithstanding some absurd restrictions which are supposed to regulate the sale, but are really little better than instruments of oppression. For about twenty years a law was in force that, if carried out, would have been absolutely prohibitive, yet at that very time a druggist paid duty on as much as six hundred pounds of opium every month. Every druggist was allowed to import as much as he pleased, and licensed retailers bought from them. But the difficulty was that only five grains could be legally bought by one person. The opium smoker does not use the drug in a crude state, and he must have at least half an ounce to prepare his extract. It followed, therefore, that not a single ounce of the one to two thousand pounds imported monthly was disposed of in a legal manner.

A great deal has been said at different times about the evils of opium smoking; but, after all, there is little harm in it. The particular vice of the negro is rum-drinking, under the influence of which he fights and quarrels; such a thing never happens after the Chinamen's dissipation. There does not seem to be any injury whatever from opium smoking—certainly nothing like that from drunkenness. I have met very many Chinamen who were much addicted to the habit and never found one of them in anything like the condition of the sodden beer-drinker or even the brandy tippler.

Judging by the quantity of opium imported, nearly every Chinaman in the colony must be a smoker. Yet they are not particularly unhealthy, nor do they die at an early age. Beyond everything they are clear-headed and sharp bargainers. To know them is to appreciate their good qualities, which are many.

Possibly, however, the Celestial may be a different person in China and other countries, for even during the last thirty years he has improved. He was once a peculiarly adroit thief, examples of

which have come within my own knowledge. His word for steal is *qui-si*, and when you put a few samples of opium before him and said, "Now, Ching, no qui-si," he would put on that well-known smile, "so child-like and bland." A stranger might even think you were insulting him. But no; the only wrong in his stealing is being found out. Put five pieces of opium before him and watch carefully. First he picks at each with his long finger nails until perhaps a quarter of an ounce has been abstracted, and then you suddenly find that only four pieces remain. Of course he has taken it, but when charged with the theft he only says, "Me no sabbee." That answer won't do for the opium dealer, and presently, with the aid of a porter, the missing lump is found under an armpit or up one of Ching's sleeves.

One of his ingenious ways of breaking into a shop was by sawing a hole just large enough to creep through. I remember two druggists' stores being robbed in this manner. Opium was, of course, the whole end and aim of the thief.

Pigs and fowls were never safe from the Chinamen's depredations. A story is told of a most ingenious theft of the latter. The fowls roosted in a calabash tree close to the house of their owner, and the difficulty was to capture them without disturbing the inmates. This was accomplished by quietly sawing off the trunk and removing the head to a distance, where the roosters could be removed without risk. A Chinaman whom I once taxed with fowl-stealing admitted that the temptation was very great. His words were, "Suppose me see 'em fowl, damn, *must* qui-si; don't care." As feathered stock is hardly ever penned, the opportunities for capturing one or two on the street are numerous.

The negro hates every race but his own. He pretends to despise the Chinaman and East Indian coolie, and speaks with scorn of the Madeira "Portugee." Even a "buccra" who works for his living in any other way than one which he considers gentlemanly is contemptible. The Madeiran as a shopkeeper is somewhat cringing, but he will dispute with his customers now and then; the Chinaman takes all the abuse showered upon him without a sign of resentment. Like water on a duck's back, it does not affect him in the least. He never quarrels with people of other races, and hardly ever disputes with his "matties." In this respect he differs entirely from the East Indian, to whom the legal gentlemen of the colony owe a large share of their practice.

In his quiet and inoffensive manner he approaches the native Indian more than any other race, and when you see him in the

bush, were it not for his pigtail and blue trousers, he might be easily mistaken for the true denizen of the forest. But, although apparently so closely allied, he does not mingle with the bucks. In the huts of the boviander we commonly see Indian women, but I have never met with them among the Chinese.

On the Camorine Creek is a settlement of these people which was commenced over thirty years ago. Taken altogether, it may be pronounced a success. In the forest, not far from an Indian village, they have put up their houses and laid out provision fields. Unlike their neighbours, the Chinese are, above everything, industrious. Always busy, their little homesteads are pictures of cleanliness and thrift. Not a weed is allowed to grow among the rice and eddoes, the surroundings of the house are free from bush, and even the hog-pen is washed twice a day.

On the opposite side of the river is a boviander village, where, in poky huts, among a wilderness of bushes and weeds, about fifty families are living. Notwithstanding the example of the Indian's open benab, these people, like the East Indians, like their dwellings to be low and thatched down to the ground, except an open space in front, where cooking can be carried on in wet weather. Often without windows or openings of any kind, these musty-smelling bedrooms are quite unfit for those in good health, but when they are occupied by the sick they are simply disgusting. In passing up the river once, I called upon a man who was lying in such a place, and when, on my return, I found that he was dead and that someone was taking down the boards of the partition to make a box, I said, "No wonder."

At the Chinese settlement things are quite different. There are proper landings, where you do not run the risk of slipping into water or mud, and as you get up a clean path lies before you. The house is high, like the Indian benab, but it differs in having walls of close palisading, through the chinks of which light and air enter freely. A good drain is dug to catch the drip from the eaves, and, as a consequence, instead of the damp floor black with fungus or green with moss that you see over the way, the well-beaten mud floor is quite dry. You do not detect that damp reek so well known in boviander huts, nor is there anything objectionable about the whole place. Even if there is a pig-stye to windward this is no nuisance. The floor is raised about two feet from the earth and several trenches underneath and on every side carry off everything obnoxious.

The Chinaman does not use a hammock. His bed is a mat laid

on boards like a broad berth on board ship. Between each sleeping-place and in front are curtains, which, though apparently never washed, are not so dirty as might be thought. There is neither bed nor pillows as we understand these articles, but a log of wood that reminds you of the headsman's block of old times takes the place of the latter and the mat of the former. Here Ching lies or lolls to smoke his opium or tobacco, with plenty of room to stretch his limbs. His wife, when he has one, appears to be even more quiet than himself, and he seems to keep her out of the way of strangers. On one occasion when, in the company of two or three ladies, I visited a house the mistress made herself quite friendly, only, however, to get a wigging from her husband. After that she kept in the background, and he brought our cups of tea himself.

Tea is, of course, the universal drink, and, as far as I have seen, they do not indulge in spirits. Every visitor is offered one of his tiny cups, "cold without," and it is always clean and nice-flavoured. As for his edibles, I have never had occasion to try them. No doubt they are good enough, but somehow or other a plate of minced meat of which you know nothing and which he eats with chop-sticks is not inviting. There is a general opinion that he likes his meat rather gamey. Some of the articles imported to the colony from China are certainly repellent; for example, dried ducks, which smell like old skins, and a sort of cabbage something like sourkrout. These things are, however, matters of taste.

The Chinaman is undoubtedly a connoisseur of good eating. Some years ago, before he had his own shops, he was a good customer to the grocery stores. Vermicelli, biscuits, prunes, and tinned meats were bought in large quantities, especially for their New Year's festivities.

The people at the Chinese settlement are Christians, and are under the care of a catechist. It is curious to hear them singing some old well-known hymn tune. The syllables fit a sing-song air very well, but do not run so smoothly in chanting. Those who do not profess Christianity keep a picture behind an altar, in front of which they burn joss-sticks. The most conspicuous part of this portrait, which is that of a very stout man with a moustache and beard, is the abdomen; possibly there may be a meaning in this connected with the Chinaman's fondness for good living.

East Indian coolies are sometimes to be seen among the bovianders, but, as a rule, they do not take to the negro or coloured man. On one occasion I gave a passage to town to one of them coming from the Chinese settlement, and was much interested with

his report. He had been engaged by a Chinaman as a labourer for three months and was now taking his first holiday, evidently pleased with himself and his late employers. Above everything else the coolie likes a man who gives him regular work and, as a matter of course, pays him fair wages. Such people he had just left. If there was not enough work for him on one clearing he was passed to the next, so that he spent no idle days, and now had enough money in his pocket to buy a cow. His account of his employers confirmed my favourable impression of them, and made me think what a pity it was that the boviander was not like them.

It is rather strange that no free immigration into British Guiana has taken place, especially in view of the fact that Chinese play some very queer tricks to get into the United States. It is true that our colony is on the wrong side of America; but as the cost of transport is continually being reduced, it might be supposed that if these people can get to New York they can also reach Demerara. The colony is well known, for several well-to-do Chinamen have gone back with money, and there are two or three firms with connections in Hong Kong.

Largely on account of this isolation, the Demerara Chinaman is becoming creolised. The rising generation no longer wear pigtails; they go to school and gain good positions in class. The girls wear frocks and trimmed hats of the latest style, losing entirely that picturesque character which seemed to suit their mothers. Now and again we see the wife of some shopkeeper dressed in silk trousers and the long, shapeless gown which give such an impression of coolness and suitability to the tropics. These look very well, but the ordinary plain purplish-brown robe, like the man's blouse, but longer, is by no means becoming.

It is interesting to note here that the Chinaman has little taste in colour as far as dress is concerned. He, however, likes expensive silks and other good materials, and the general result is pleasing. Although not so picturesque as the East Indian, the Chinese woman often impresses you with the idea that she dresses to suit the climate. Yet there is not the least suggestion of indecency or nakedness; on the contrary, notwithstanding the trousers, there is a stern severity, hardly attractive enough to suit any European female but an old maid. No doubt the race was developed in cold climates, where something like a cloak of furs or other thick material in winter gave place to a similar loose dress in summer.

The only people in British Guiana who dress to suit the climate are the East Indians. The European is, perhaps, the most absurd.

The more respectable man's dress, which is aped by the negro on Sunday, is the black coat and tall hat of the old country, although he is well aware that a loose white jacket and straw head covering are better in every respect. As for the white ladies, they suffer greatly because they will wear everything tight. The consequence is that, as there is no recognised form of loose dress, they spend most of the day in their bedrooms, and, after going out, hurry there at once to relieve themselves from their torture. The Chinese woman has no difficulty of that sort, for the deformed feet are not known here; neither does the East Indian woman suffer from any such evils.

THE ESSENTIAL NEEDS OF MODERN NAVIGATION.

BY

G. W. LITTLEHALES.

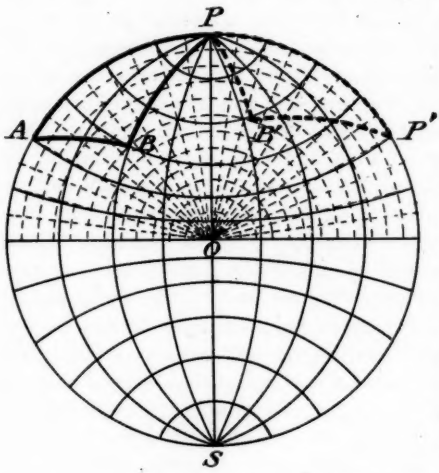
The substance of the science of ocean navigation is comprised in the deduction of position and direction from observations of celestial bodies, or in enabling the navigator to find the place where he is and the direction of the place to which he is to go. The greatly-increased speed of ocean vessels of the present day has necessitated more frequent observations to ascertain the ship's position and the errors of the compass, and it is highly desirable that laborious and extended systems of calculation should be obviated and that some short, sure, and simple method should be made available to the navigator, by means of which he shall be able to deduce the results of his celestial observations before the ship has moved far from the place where the observations were taken. A thoroughly satisfactory method of effecting the graphic or mechanical solution of almost any of the elements of the astronomical triangle would probably be turned to use at once among navigators. For example, if a method should be brought out for conveniently obtaining with the required accuracy, in a few minutes, the altitude and azimuth of a celestial body from its declination and hour-angle and the estimated geographical position of the observer, navigators and geographers could at once employ the method to advantage in finding the Sumner's Line of Position. For an observer, having measured and found the true altitude of a celestial body and then deduced the altitude and azimuth of the observed body due to the estimated position of the ship, could draw a line on his chart through the estimated geographical position of the ship at right angles to the azimuth of the observed celestial body, which might be appropriately called the Sumner's Line of Position by Account; and next, comparing the instrumentally-measured true altitude with the altitude due to the estimated geographical position, he could at once draw the actual Sumner's Line of Position, since it would be sensibly parallel to the Line of Position by Account and removed from it by a perpendicular distance equal to the difference in minutes of arc between the observed and deduced altitudes and toward the direction of the observed celestial body or away from it, according as the true altitude obtained by observation is greater

or less than the altitude deduced by dependence on the estimated geographical position.

It may, therefore, prove of value to indicate a way in which it is probable that the altitude and azimuth of any celestial body may be found simultaneously and without calculation.

The accompanying figure represents a stereographic projection of the celestial sphere on the plane of the meridian.

If the latitude of the observer be laid off along the bounding meridian at A, and the declination of the observed celestial body be laid off at B along a meridian making an angle with the bounding meridian equal to the hour-angle of the observed celestial body, an astronomical triangle will be formed in which the known parts are the two sides PA and PB, representing respectively the co-latitude and co-declination, and their included angle APB, which is the hour-angle of the observed celestial body. The unknown parts of this triangle are the azimuth, PAB, and the co-altitude, AB, of the observed celestial body. If the triangle, PAB, were revolved about the central point of the projection, with the side, PA, kept in coincidence with the bounding meridian, until the point A is brought to the position of the point P, the latter would then occupy the position P′, and the point B would fall at B′, so that the unknown side of the triangle, representing the co-altitude, would lie along some meridian, and could be measured from the graduation of the projection, and the unknown angle, representing the azimuth, would become an included angle between two meridians, which could likewise be measured from the graduations of the projection. And thus the altitude and azimuth of any observed celestial body could be read from the diagram with any degree of precision that the scale of the projection might permit. To obviate the necessity for the actual revolution of the triangle, as



described above, a series of equally-spaced concentric circumferences and a series of equally-spaced radial lines have been drawn over the projection in lines of dashes. For the purposes of identification, the overlaid system of concentric circumferences should be numbered serially from the centre of the projection outwards to the bounding meridian, and the radials should also be marked by numbers indicating their angular distance in minutes of arc counted in a clockwise direction from some fixed origin, like the line OS; so that, having plotted the declination and hour-angle of the observed celestial body at B, it is only necessary to note the number of the circumference and the number of the radial which pass through this position, and then, adding the co-latitude expressed in minutes to the number of the radial, find the intersection, B′, of the noted circumference with the radial whose number is the sum just found, and read off from the graduated arcs of the projection the altitude and azimuth of this point of intersection.

In order that such a method may displace the longer and laborious methods of obtaining the results by calculation, it is necessary that the scale of the projection should be large enough to admit of plotting the data and reading off the results to the nearest minute of arc. To provide for such a scale, the stereographic projection would have to be constructed with a diameter of about twelve feet, which, in one continuous sheet, would be of unmanageable size for ordinary use. It is certain, however, that such a projection could be reduced to convenient dimensions for use by being cut up into overlapping sections about the size of leaves of a book, and used with the same facility as if preserved in one continuous sheet; for it has been pointed out that, in carrying out the proposed method of solution, only those parts of the projection are involved which lie in the immediate vicinity of the points whose coordinates are to be plotted or read off.

U. S. Hydrographic Office.

THE RAILROAD TO MECCA.

This map of the projected railroad between Damascus and Mecca, the northern part of which is now building, is taken from the *Geographischer Anzeiger*, published by Justus Perthes, Gotha (July, 1902). The railroad has been heralded throughout the Mohammedan world as a facility to be provided for pilgrims to the holy city, giving them quick and easy transport across the thirsty desert of western Arabia. The distance by rail between Damascus and Mecca will be about 1,250 miles; as the Haúran railroad, already completed, will be utilized for 63 miles south of Damascus, the Mecca road proper will be a little less than 1,200 miles in length.

The estimated cost is over $40,000,000, and the Sultan of Turkey is depending upon the voluntary contributions of Islam for the necessary funds. Contributions to the amount of nearly $2,000,000 were received within a comparatively short time after the Sultan's enterprise had been announced, and, with this money in the treasury, work was begun about the middle of last year. At last accounts it was expected to complete the roadbed to a point 125 miles south of Damascus by the end of August, this year.

The projected line follows an old pilgrim route through the almost waterless desert, very sparsely inhabited by wandering Bedouins. As very little of Arabia has yet been studied in relation to its economic importance, the value of the line to the development of the country cannot be foretold. It may be that the road will give accessibility to important sources of minerals and ores, and thus have economic value; but this remains to be shown.

The utility of the railroad in religious and political senses is the aspect of the enterprise that most appeals to Mohammedans and to the Turkish Government, which has set the project on foot. The various sects of Islam, though opposed to one another on some questions of faith, are in enthusiastic accord, it is said, as to the desirability of making Mecca and Medina, the one the burial place and the other the birthplace of Mohammed, accessible to pilgrims by rail. The project interests not only Mohammedans of the Turkish Empire, Russian Turkistan, and Persia (who would be most directly benefited by the Hedjaz or Pilgrim line, as it is called), but also those of India, Java, North Africa, and other regions, who reach Mecca *via* the Red Sea and Jiddah; the railroad would enable them to visit both Mecca and Medina, while the majority are now

Beirut
Damascus
Haifa
Jaffa
Jerusalem
Nablus
Tulul
Ruhbe
Safa
Amara
Dj Hauran
Kasr Burdan
Kasr Azrak
Kara
Wale
Bir Derwan
RUALA
BISCHR-ANASEH
(Wintergegend)
ULED-ALI
Hammada (el Hamad)
BENI-SOKHR
SCHERARAT
Dj Misma
HOWEISIM
Djauf
Sakaka
Kara
Sandwüste
el Hedjer
Tebuk
Teima
Khabrah
Hedjer (Hadjra Salih)
el Hedjer
Dj Anemar
Kosseir
Dj Istabal
Sadjura
Medina
Yenbo
Janbo Kafr
Janbo el-Bahr
Badr Honein
BENI-SUBH
BENI-AUF
SEBUD
Cap Hiba
Djidda
Ras el-Auwad
Scherm Schaibe
Scherm Ubhor

compelled to confine their pilgrimage to Mecca. Contributions are accordingly being received from all parts of the world where Mohammedans live, including even Cape Colony and Australia.

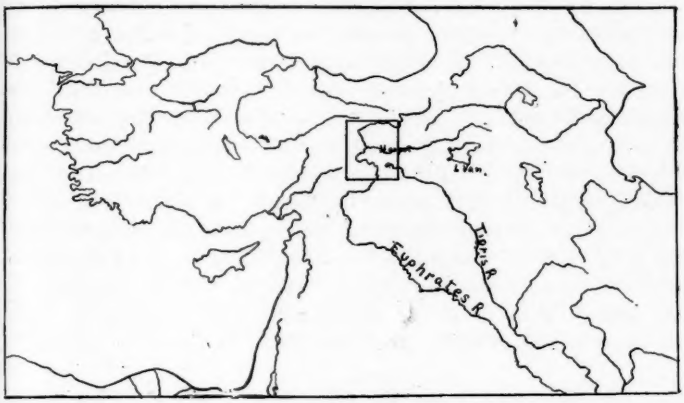
The leading motive of the Sublime Porte is believed to be its political exigencies. At present Turkey is practically cut off from a large part of its possessions in Arabia. The movement of Turkish troops between the holy cities and Turkey is now very difficult. As the present head of the Mohammedan faith, the Sultan cannot retain his prestige without insuring his authority over the pilgrim routes and the holy cities. The fact that he is losing his authority in southern Arabia is shown by the British assumption, in recent years, of a protectorate over the entire southern coast of Arabia from the Strait of Bab-el-Mandeb to the Sultanate of Maskat. It remains to be seen whether the entire sum required to build the road can be secured by voluntary contributions. The work thus far is in charge of German engineers, with assistants from the Turkish Engineer Corps.

THE VALLEY OF THE UPPER EUPHRATES RIVER AND ITS PEOPLE.

BY

ELBSWORTH HUNTINGTON.

On account of the mountainous character of the country, and the obstacles to travel imposed by the Government, many of the most interesting parts of Turkey are almost unknown to foreigners. One of these is the "vilayet" or province of Harput, about as large as the States of Massachusetts and Connecticut combined.



ASIA MINOR AND ADJACENT REGIONS.

It contains not only the fertile plains of Harput and Malatia, the rugged mountains of Shiro, and the wild fastnesses of Dersim, where the Kurds are still independent, but also the meeting-place of the two streams which form the famous Euphrates river. Elsewhere I have described in detail the great river and its cañon, the archæology of the region, and its climate; in this paper it is my purpose to give a general description of the geography, using the word in a broad sense to include the physical features, the inhabitants, and the relation of the two.

TAURUS MOUNTAINS.—On the south lie the Taurus Mountains, which run nearly east and west from the northeastern angle of the

Mediterranean Sea to a point south of Lake Van. The rather flattened, square-shouldered summits vary in height from 5,000 to 8,000 feet, and are separated from the waste-floored intermont basins by slopes which are usually steep even when covered with soil, and almost everywhere show ledges and cliffs of naked rock. In the very middle of the range is a great longitudinal valley, containing Lake Gyuljuk, which lies high in the neck of a great bend of the Euphrates river, and gives rise to the longest branch of the Tigris river. At this point the mountains contract from a width of a hundred miles, and a height of 6,000 feet or more at the passes, to a width of only thirty miles, and a height of but little over 4,000 feet, so that there is an opportunity for easy communication between the people of Mesopotamia and those of the series of elevated plains which form the floors of the intermont basins. The important road which here crosses the mountains from north to south forms the only much-used wagon route in an east and west distance of over four hundred miles. In ancient times this physiographic feature seems to have been as important as now. A comparison of the prehistoric mounds found in the plains just north of the contracted portion of the mountains, on the one hand, with those still farther to the north and at a distance from the low, narrow part of the mountains, on the other, shows that while the latter are of purely Thraco-Armenian style, the former—*i. e.*, those near the break in the mountains—by their size and composition, and by the bricks and burial urns which they contain, indicate that at this place of easy passes Babylonian influence crossed the mountains, which elsewhere interposed an almost impassable barrier.

Interior Plains.—The plains of the interior, like those of the Basin region of the western United States, are typical examples of deformed basins, partly filled with waste from the surrounding mountains, under the influence of a somewhat dry climate. They lie in several longitudinal series, between great mountain ranges. The series which lies just north of the Taurus Mountains stretches from Alashgerd, north of Lake Van, to Malatia, and contains eight main plains. Those that I have seen are very smooth, although they have a general slope toward and with the streams which drain them, and the line where they abut against the mountains is so marked that, when seen from an elevation, it suggests a shore-line, with bays and promontories. I am inclined to believe that the basins, of which the plains form the floors, have been formed by depression and faulting or folding, and have been filled by waste

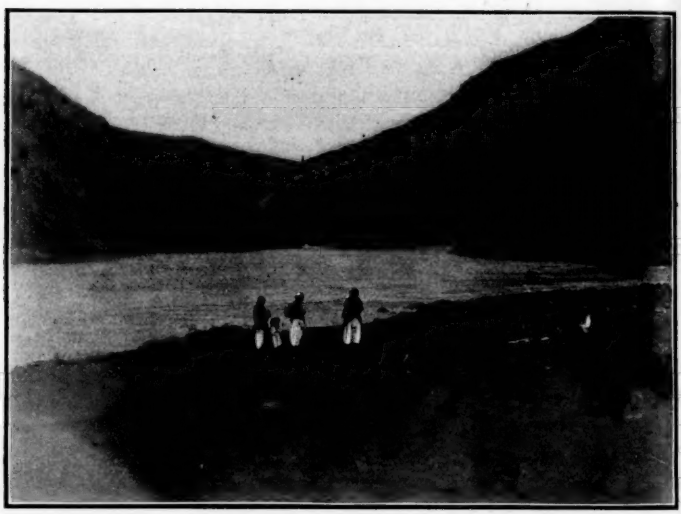
from the mountains, brought in by streams and deposited partly by the streams themselves, but more generally in lakes, as is shown by the uniformly fine character of the deposit in the centre, and by the marshy tracts which still persist as witnesses of the former lakes. Most of the population naturally centres in these fertile, easily-tilled regions.

ANTI-TAURUS MOUNTAINS.—North of the plains lie the Anti-Taurus ranges, the highest and most rugged of which are the Dersim Mountains, which, when seen from the south from the mountains around Harput, show a number of parallel ridges, which gradually grow higher toward the north. My one journey across them made it clear that they become much more rugged and, perhaps, more youthful in the northern portion. The southern ranges have rounded, gently-domed summits of varying height, with moderately steep, usually soil-covered slopes, supporting a growth of oak scrub, and are separated by broad valleys. The highest ridges, which reach an elevation of from 10,000 to 11,000 feet, present a crest-line of comparatively even height, with few detached peaks, but very many smaller elevations, producing a roughly-jagged, serrated sky-line. The tops of the mountains are naked rock, chiefly limestone, and the sides are, for the most part, barren ledges, bordering steep, inaccessible valleys. On the north the highest ridge of the Dersim Mountains falls off steeply 6,000 feet or more to the plains and valley of the western branch of the Euphrates. The wildness of the mountains has prevented the Government from fully subduing the lawless Kuzzilbash Kurds who inhabit them.

DRAINAGE.—Except for the strange angle around Lake Gyuljuk, where the branches of the Tigris rise within five miles of the great encircling curve of the Euphrates, the whole region is drained by the latter stream. Numerous wet-weather mountain torrents bear immense quantities of waste down their steep valleys to the larger, imperfectly-graded streams, which, in turn, give it to the Euphrates to use in building up the fertile plains of Mesopotamia. The main rivers flow characteristically in large, right-angled zigzags, where the east and west part parallel to the mountains is a quiet river flowing usually on or slightly intrenched in one of the plains, while the other part, transverse to the mountains, leaves the open valley and flows over rapids through a steep gorge or cañon. Almost universally the streams are so young that they have not yet had time to broaden their valleys and develop flood-plains. Accord-

ingly, as in all such countries, the people find it easier to climb over the mountains than to clamber along the steep sides of the rocky valleys. Communication is, of course, very slow and rare, and the effect of this is seen in the provincialism of the people and the great number of local dialects and customs.

THE CAÑONS OF THE EUPHRATES RIVER—EVIDENCES OF YOUTH.—Near the centre of the Harput vilayet the two main branches of the Euphrates unite and form the stream which has for so long been famous. It enters at once into a cañon, from which it emerges into the Malatia plain, only to plunge into the deepest and wildest



ON THE EUPHRATES, LOOKING AT THE UPPER END OF THE CAÑON THROUGH THE TAURUS MOUNTAINS.

of all the cañons. This immense cutting through the Taurus Mountains is, in certain places, almost as deep and grand as that of the Colorado, and the two resemble one another in many ways, although the Euphrates cuts across a folded mountain range, while the other is incised in a flat plateau. The extreme youth of the Euphrates is indicated by the numerous great rapids, the swift current, the steep walls and narrowness of the V-shaped valley, and the little hanging valleys which open into the cañon high on its sides. Below the mouths of these latter the main stream has cut so fast that the little ones could not keep pace with it, and are

obliged to fall into the river in a series of lovely cascades. These hanging valleys are interesting as furnishing one of the very few examples of the normal type, although the glacial type is characteristic of many northern countries. The latter open at a high level into steep-sided but very wide and flat-floored U-shaped valleys with meandering streams. Those of the Euphrates and the Colorado, on the contrary, open into narrow, precipitous, V-shaped valleys, where the river not only has no room to meander, but has not even a flood-plain, and washes the solid rock at the base of the sides. Other streams tributary to the Euphrates in this part of its course flow in steep-sided, narrow, new valleys cut in the bottoms of broader, flatter, older valleys. These seem to show that the Taurus Mountains have been re-elevated and the streams tilted in very recent geological times, so that the slope of the streams has been increased, and they have rapidly cut narrow valleys in the bottoms of the old ones.

Climate and Irrigation.—In climate the Harput vilayet somewhat resembles the State of Colorado. The long dry season lasts from the middle of June to the middle of October, and dries up all vegetation, except where there is running water. During summer the long-continued heat is trying in the lowlands, but on the mountains the nights are always cool. Spring and autumn everywhere enjoy a delightful climate, and the winters, with some snow and a temperature ranging from 10° F. to 40° F., are cold enough to be bracing, but are not severe. The rainfall of twenty inches or more is sufficient for all sorts of crops, but, owing to its uneven distribution through the year, irrigation is everywhere necessary. It is carried on in the most primitive way by small open ditches, and no attempt is made to conserve the supply of water, either by making reservoirs or by planting trees on the deforested mountains. Many, perhaps half, of the fields that are in use have no water supply, and are planted on the chance that the rain may be abundant; consequently in dry years the crops fail and there is much distress. Most of the larger streams are slightly intrenched in the plains to a depth of from twenty to a hundred feet or more, and, so far as I have seen, are never utilized for irrigation, although they might easily be used if several villages would combine. No one trusts his neighbour, however, and no one cares to work when he fears that the profit of his labour may be taken from him by violence or fraud. In the Malatia plain I saw a hundred square miles of the finest black soil lying unused, although surrounded on three sides by rivers, which might easily be turned on the land by

canals a few miles long. As far as possible, villages are located on the edges of the plains, where water is abundant and pure; but where the plains are too large for the centre to be reached daily by farmers living on the edge, villages grow up wherever there is water at the surface. In such villages some wells are dug. The size of a plain may often be gauged by the location of its villages.

THE DESTRUCTION OF FORESTS.—Previous to the Christian era the whole country, except the plains, seems to have been well wooded; but now the mountains are bare, except in the remoter districts of Shiro and Dersim, where there are so-called forests, which consist mostly of oak scrub, with some large oak trees. Even this growth is fast being cut away; and when it is once gone, new trees have great difficulty in starting, because here, as in so many other cases, the soil is washed away very rapidly, and the goats eat up the young sprouts, which might otherwise start new forests. Only the gnarled, inhospitable, thorn apple tree is able, by means of its spines, to defend itself.

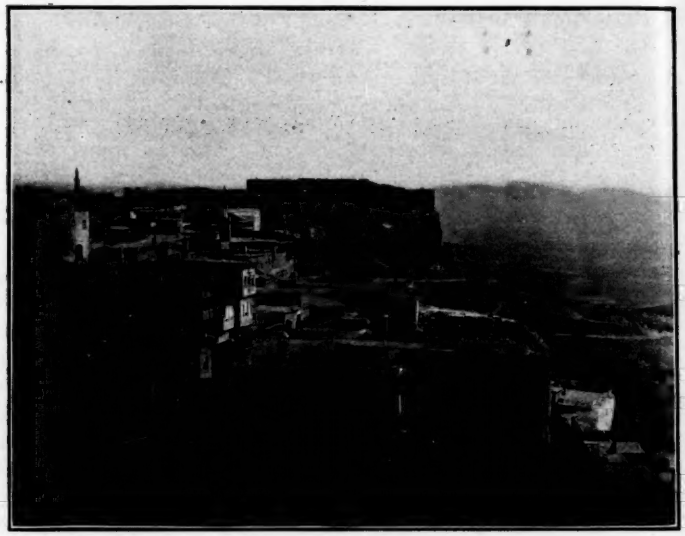
WILD ANIMALS.—Among the mountains but few animals are found, although insects and birds are abundant. Long-legged jerboas hop over the stony ground; hares are hunted during the winter; foxes and wolves are sometimes forced to approach the large towns by the stress of winter, and the latter are said to engage in fierce fights with the half-wild dogs which roam the streets of every city and town. Among the rougher mountains ibex are numerous, while in the more level regions there are a few gazelles. The people of the open plains and treeless mountains have a strange fear of the forests and of the fabulous snakes and wild beasts which they are supposed to contain, although the only dangerous animal is the comparatively harmless brown bear. He is held in great respect because of a certain impish hostility which he is supposed to entertain toward man. One night, when floating through the cañon of the Euphrates on a raft of skins, I decided to camp on the only available site—a little ledge of rock at the foot of an overhanging precipice. The Armenian raftsmen were much alarmed. "Don't stop here," they said, "the bears will come in the night and throw stones upon us from the top of the precipice." The only game bird that is much shot is the partridge, although wild pigeons, ducks, snipe, bustard, and other birds are abundant. Snakes are very rare, but turtles are found everywhere.

VEGETATION OF THE PLAINS.—The plains have probably worn nearly their present appearance ever since the dawn of history.

That of Harput, in the centre of the country, is fairly representative of the larger and richer ones. For four years I saw it spread out like a map at the foot of the mountain on whose top the houses of the city cluster round the ruined castle, twelve hundred feet above the plain. Each year the wonderful change from season to season was more impressive. No dweller in a green land like the eastern part of America can fully realize the beauty of the brief snatch of spring verdure which in this semi-arid land is gone from the lower mountains almost as soon as it comes, and stays on the plains but two or three short months. During the time of the spring showers, from the middle of March to the middle of June, the plains resemble our prairies, except for the universal background of mountains, which are never out of sight in Asia Minor. In the early spring broad stretches of waving grain are brightened by red tulips and big blue grape hyacinths, and later are gay with yellow mustard and red poppies. Occasionally unsown stretches are covered with a veritable sheet of purple, blue, yellow, red, or white flowers. Seen from above, these, with the far more numerous green grain fields and the brown ploughed land, give a strangely-checkered plaid effect. Before the end of June the last showers have fallen, the bright flowers have given place to thistles and a few other hardy inconspicuous compositæ, the wheat and barley are turning yellow, and soon the plains assume the same dull grayish or yellowish-brown which the mountains always wear. After the long cloudless summer a few heavy autumn rains in October bring out such flowers as the yellow crocus, and the winter wheat gives some verdure to the plain, but in general the brown remains until it is covered with snow in late December or January.

Changes in the Appearance of the Villages from Season to Season.—In early spring, before the leaves of the trees come out, the villages, with their flat-roofed houses of sun-dried brick, crowded together as closely as the cells of a wasp's nest, look like unsightly gray daubs of mud breaking the smooth verdure of the surrounding fields. Later, this ugliness is masked by the dark green of the encircling gardens, with their fruit trees (chiefly mulberries), their vineyards, and their slender, closely-trimmed poplars, which are planted in stiff rows, and form the only timber of the country. May and June are the time of greatest beauty, when the light green of the fields, the dark green of the vineyards, and the still darker green of the trees make the villages look like bits of Eden, set most of the time beneath the bluest of skies against a back-

ground of imposing brown mountains tipped with glistening snow. It is at this time that the real value of the omnipresent mulberry tree is evident. The leafy branches are cut for silkworms, and the berries are not only eaten at almost every meal, but some are dried, and either kept as a sort of raisin or powdered into flour for sweetmeats; while others are boiled to make molasses or *bastegh*—a sweet leathery gum, which is kept indefinitely in the form of great thin sheets and is eaten like candy. When the mulberry season arrives the number of beggars in the cities is materially decreased, for



PART OF THE CITY OF HARPUT.

many of them go to the villages, where they camp under the mulberry trees and literally live on the fruit.

With the mulberries come the hot days of summer, when the villages are dusty green patches set in a frame of fields of stubble; then follow the gray days of autumn, when villages, trees, plains, mountains, and sky seem at first sight indistinguishable. And lastly, in the winter the villages once more seem to be what they are—clusters of miserable mud hovels, soiling the purity of the snow, and often shut in for two or three weeks by a benumbing valley fog which keeps out all the sun's heat and makes the plains inexpressibly dismal, although the higher mountain slopes above

the sea of fog are rejoicing in the most perfect winter weather, with a temperature ten or fifteen degrees higher.

I have spoken of the mountains and of the plains, but the most attractive region lies between the two, at the mouths of the little valleys where the mountains join the plains and send out numerous springs. Water is here abundant all the year, and so, in spite of the perfect chaos of boulders, pebbles, and sand brought down by floods, the villagers clear the stones away on the two sides of the channel and make gardens in the midst of a very desert. It is in such places that the finest vineyards, orchards, and vegetable gardens are found; and it is there that one realizes what a splendid country this might be if it were properly developed.

THE PEOPLE—KURDS.—These rugged mountains and level plains, with their fine climate and splendid possibilities, are inhabited by three races—Armenians, Kurds, and Turks—the remnants of successive migrations. Of these races the most primitive is the Kurds, probably the Carduchi of Xenophon, who comprise three main divisions—Kurman, Zaza, and Kuzzilbash—differing in language and customs, and probably in race, although all are usually spoken of as Kurds. The Kurmans, in the few places where I have seen them, are an avaricious, suspicious people. Farther south they are partly nomadic, and have retained their own character and customs, but here among the Turks they are sedentary, and have assumed many of the traits and habits of their neighbours. The Zazas are more interesting, perhaps because I know them better. They are largely shepherds, and either live among the mountains or are nomads wandering to Mesopotamia in winter and to the high mountains in summer, giving a simple illustration of climatic control of mode of life. In character and habits they much resemble the third division—the Kuzzilbash—although they are much better Moslems.

THE KUZZILBASH—ORIGIN AND RELIGION.—Kuzzilbash means "red head," but whether it was applied to the people whose centre is in Dersim because of their fair complexions, or because of the red turbans which they often wear, is uncertain. They seem to have come westward from Persia, and to have brought with them a language related to Persian, some traces, possibly, of Persian fire worship, and the Persian or Shiah doctrine of Mohammedanism. The orthodox or Sunni Turks consider this Shiite doctrine the rankest heresy, and regard its professors as even more contemptible than Christians. The migrating Kuzzilbash found in the

mountains a population of Christian Armenians, with whom, in course of time, they mingled, so that Armenian words and names are common in their language, and their religion has become a strange mixture of Shiite Mohammedanism and Christianity, with a trace of Paganism. Accurate information is hard to obtain, because, in talking with a Christian, they try to make their religion appear like Christianity. A prominent "agha" or village chief said to me:

We have four great prophets—Adam, Moses, David, and Jesus—of whom Jesus is the greatest. We have four holy books. [He used the word that is always used for the four Gospels.] All religions are but different roads to the same end—one long, one short, one easy, one hard. You go yours, and we go ours.

When I tried to talk about Mohammed he avoided the subject as though it were unpleasant, and others who were present insisted on changing the subject, so that I could learn nothing. The Kuzzilbash are said never to pray in private, but only when led by one of their sehids or religious chiefs, who have great influence among them. At certain times they observe a sort of sacrament, which closely resembles the Christian communion service. I have heard of this many times from Armenians who lived among them, but no competent observer seems to have witnessed it. The Kuzzilbash reverence all Christian sanctuaries and churches, and will even go into a church where service is being carried on and take part, kneeling and bowing with the Christian Armenians. To be sure, they will do the same thing in an orthodox or Sunni mosque; but in the latter case it is for fear of persecution, while in the former it is a matter of their own choice.

Relation of Kuzzilbash and Turks.—Wherever the Kuzzilbash live in open, easily-accessible regions the Turks oppress them. I stopped one night at a village whose inhabitants I knew to be Kuzzilbash, and after we were seated in the dark, dirty, mud-floored, mud-walled room of the agha, I addressed them as such, in Turkish. By the light of the smoking, ill-smelling linseed oil taper I could see that their faces looked troubled, and they all asserted that they were Sunnis, not Kuzzilbash. A little later, when my escort, a Turkish soldier, left the room, an old man pointed to the whip which the Turk had left on the floor.

"What is that for?" he said.

"For his horse," I answered.

"No, it is for men, for us Kuzzilbash," and he went on to tell me a long story of how the soldiers had of late years come every year at harvest time and beaten them in order to extort more taxes.

(*To be continued.*)

THE UGANDA RAILROAD.

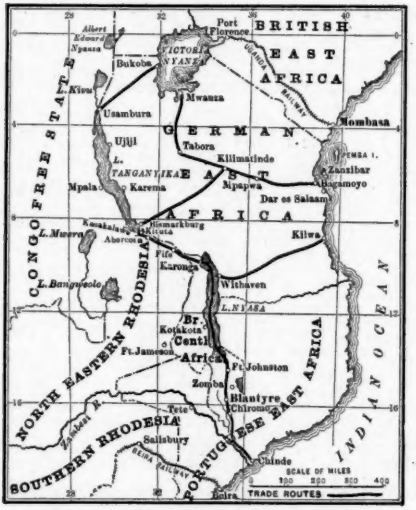
The most important feature of economic progress in tropical Africa, in the past year, was the completion of the Uganda Railroad between Mombasa, on the Indian Ocean, and Port Florence, the most easterly point on Victoria Nyanza. The building of the road occupied about six years. The chief engineer and his staff arrived on the ground in December, 1895. Eight months later the first miles of rails were laid on the mainland; and in December last the first locomotive reached Port Florence. The road is 582 miles in length.

It was built under extraordinary conditions, which would have made progress very slow if the work had not been carried on with the greatest resolution and energy. At the outset it was found that Mombasa Island could not supply suitable water for the many hundreds of men who were needed to build the harbour works; a condensing plant was ordered from England by cable, and water was obtained by this means. No African labour in the British territory was found to be suitable for preparing the roadbed and laying the track; twenty thousand men were therefore imported from India, mostly Punjabis, who had to be supplied with food from their own country. The natives could be utilized only as porters on the march and with the survey parties. The engineers and executive staff found it necessary to learn to speak the two principal languages along the route. At the lower altitudes the entire force suffered severely from fever, smallpox often appeared, and the work was further embarrassed by strikes in England, which at times made it difficult to obtain material and locomotives.

Many engineering difficulties were encountered. From sea-level at Mombasa the line had to climb to a height of 7,900 feet at the Kikuyu escarpment, near Mount Kenia; then descend to 6,000 feet in the Rift Valley, a little farther west; then climb to 8,320 feet at the Mau escarpment, sixty miles further west; and then descend to 3,726 feet, which is the altitude of Victoria Nyanza above the sea.

The railroad is already bringing about radical changes in the country through which it passes. All along the route the Indian rupee is now the medium of exchange, though before the road was built only beads, wire, and cloth were accepted as money by the natives. The privations, delays, and troubles of the old caravan road are becoming things of the past. Upon the opening of the

whole line to passenger traffic the journey between Mombasa and Port Florence will be made in two and a half days. A steamer is to connect Port Florence with Mengo, the capital of Uganda, on the north shore of the lake. Allowing another day for this water journey, the time between the Indian Ocean and the heart of Uganda will be three and a half days, as against seventy days by the caravan routes. Travellers are now passing over two-thirds of the route in sleeping cars at a rate of six cents a mile, and cable messages may be sent from any station on the road.



TRADE ROUTES IN EAST TROPICAL AFRICA.

The railroad has cost about $26,000,000, including the harbour works at Mombasa and Port Florence, and two steamboats on Victoria Nyanza. The cost has been much less, proportionately, than that of the Congo railroad, the British having had the advantage of the cheap and efficient labour supplied by the East Indian natives, who were transported, at small expense, to East Africa, and were found to be well adapted to the climate.

The caravan routes between the ocean and Lakes Victoria and Tanganyika will be practically put out of business by the Uganda railroad. Steamers on both lakes will distribute freight to all parts of the coasts, the caravan route between the two lakes being utilized till the proposed German railroad is built between the Indian Ocean and Tanganyika. The accompanying map, prepared from some of the material in a larger map (*The Geog. Jour.*, 1902, May, p. 600), shows the position of the Uganda railroad and its geographical relation to the caravan routes that have been the commercial highways between the sea and the lake region.

DISCOVERIES IN CENTRAL ASIA AND TIBET.

The expedition to Central Asia and Tibet, sent out in the spring of 1899 by the Russian Geographical Society, under the command of Captain P. K. Kozloff, has accomplished very important results. The geographical discoveries relate (1) to the Chinese or Mongolian Altai, the great mountain chain extending across western Mongolia from Siberia far towards China; (2) to the Gobi, between the eastern part of the Southern Altai and the northern frontier of China; and (3) to the eastern part of Tibet, known as the Kam.

Distinctive features of the expedition were: the sending out of separate excursions from the main body of the caravan, thus widening the domain of exploration; the maintenance for fifteen months of a meteorological station in eastern Tsaidam (northeastern Tibet), the first time that such work has been done in Central Asia; and the study of the depths, flora, and fauna of Central Asian lakes with the aid of a canvas boat.

The Altai were explored both on their northern and southern sides. It was found that the part of the mountains lying to the west of Kobdo (about 92° E. Long.) are high, and contain masses of glaciers and snow-clad peaks. These mountains have abundant precipitation and extensive forests. To the east of Kobdo, however, the mountains rarely reach the snow-line, and, owing to the dry southern winds from the Sungarian desert and the Gobi, have few forests and Alpine meadows, though the Mongols here raise many sheep, cattle, horses, and some camels.

The Gobi desert was crossed in three directions by various expeditions led by Kozloff and his companions Ladyghin and Kaznakoff. They found the Gobi very different from the descriptions usually given of it. The Gobi has often been represented as a flat land covered with sand and having no mountain features except in its western part. The northern part of the Gobi, however, for about 200 miles southward, is crossed from east to west and from northwest to southeast by mountains and ranges of hills, among whose valleys Mongols, with their herds of camels, are occasionally found. This part of the Gobi is easy of access, and is crossed by many routes provided with wells containing sweet or slightly brackish water. The central part of the Gobi is hilly in the northern portions and sandy in the south. It was crossed successfully by Kaznakoff, with the assistance of the Mongols. The southern part is a barren

desert, covered with sand. Here all the riding horses died for want of grass.

The third field of exploration was the Kam, as the little-known and mountainous eastern part of Tibet is called. Being under the influence of the monsoons from the Indian Ocean, it is rich in rainfall, which feeds the mighty rivers that have their source on the plateau. Great ranges of snow-clad mountains, with many lower ranges and deep river valleys and narrow gorges between them, characterize the Kam. Further west, where the surface of the plateau becomes even higher, it is less mountainous, the dryness of the climate progressively increases, and grass is supplanted by a gravelly desert.

WATER PARTINGS BETWEEN FOUR GREAT RIVERS.

The region shown in the accompanying map, based upon a map in *The Geographical Journal* (1902, May, p. 579), is the scene of Kozloff's explorations in the Kam. His route is depicted, and also the mountain ranges that form the water-partings between the great river systems of the Hoang, Yangtse, Mekong, and Salwen. The lake sources of the Hoang appear in the map; the Yangtse rises further west on the plateau, and the sources of the Mekong are probably much further in the interior than they have yet been shown on the maps. The natives said the upper Salwen was an insignificant river, easily forded, whose sources lie in the mountains, not far from the high road to Lhasa.

On the road to Tsamdo the party was attacked by a military detachment of Tibetans, who were repulsed after a sharp fight.

Representatives of the Lhasa authorities, however, implored the Russians not to enter the monastery of Tsamdo, which is one of the great sanctuaries of Tibet. The explorers accordingly turned east and wintered in the warm, wooded valley of the Ra-Chu, a tributary of the Mekong. Here meteorological and astronomical observations were made, numerous specimens of the flora and fauna were collected and many materials relating to the history and ethnography of the Tibetans. The country was explored as far eastward as the monastery Derghe-gonchen.

The population of this part of Tibet is partly settled and partly nomad. The settled inhabitants have their houses and farms in the valleys and gorges, where they grow cereals up to an altitude of 12,000 feet. The nomads pitch their black tents in the region of the Alpine meadows, whose upper limits are some 3,500 feet higher than the limits of the agricultural zone. The settled population, living better than the nomads, occupy houses of small logs or wickerwork covered with clay, usually two to three stories in height—the lower floor for the cattle and the others for the inhabitants, and also for grain and hay storage. The dress of both sexes is sheepskin, though in summer the richer folk wear a sort of woollen dressing gown. They practice polyandry, several brothers often taking one wife.

The work of the expedition included about 8,000 miles of survey, forty determinations of geographical positions, daily meteorological observations, many photographs, and very rich natural history collections, which are now being studied by specialists in St. Petersburg. The fullest reports on the work of this fruitful expedition, excepting those in the *Izvestiya* of the Imperial Russian Geographical Society, have appeared in *Petermanns Mitteilungen* (1901, pp. 90, 160, 182, 205, 237, 260; 1902, pp. 137, 163, 184), and in *The Geographical Journal* (May, 1902).

PHYSIOGRAPHIC NOTES.

BY

RALPH S. TARR.

USE OF CERTAIN PHYSIOGRAPHIC TERMS.—In the *Journal of Geology* (Vol. X, 1902, pp. 77–111) Professor Davis makes a characteristically clear and convincing plea for more careful usage of the terms base-level, grade, and peneplain. By quotations from the writings of numerous authors he shows that *base-level* is given very different meanings by different writers:

> These meanings are: an imaginary level surface in extension of that of the ocean (the convex geoid surface); an imaginary mathematical plane; an imaginary surface, sloping with the mature or old streams of its area; the lowest slope to which rivers can reduce a land surface; a level not much above that of the sea; a slow reach in a stream; a condition in which rivers cannot corrade, or in which they are balanced between erosion and deposition; a certain stage in the history of rivers when vertical cutting ceases and their slope approximates a parabolic curve; an ultimate planation, and a plain of degradation.

Professor Davis points out the desirability of associating the term base-level with only one of these meanings, and suggests the limitation of the term to that meaning, and to define it *as the level base with respect to which normal subaerial erosion proceeds;* to employ the term *grade* for the balanced condition of a mature or old river; and to name the geographical surface that is developed near, or very near, to the close of a cycle, a *peneplain*, or *plain of gradation.* It is believed that most physiographers will see the desirability of thus limiting these terms.

As Professor Davis says, his article is more than a plea for names. Among other things it contains an excellent and very clear discussion of the complex subject of *grade*, as applied to land reduction. He says that

> the balance between erosion and deposition, attained by mature rivers, introduces one of the most important problems that is encountered in the discussion of the geographical cycle. The development of this balanced condition is brought about by changes in the capacity of a river to do work, and in the quantity of work that the river has to do. The changes continue until the two quantities, at first unequal, reach equality; and then the river may be said to be graded, or to have reached the condition of grade. . . . In fine, grade is a condition of essential balance between corrasion and deposition, usually reached by rivers in the mature stage of their development, when their slopes have been duly worn down or built up with respect to the base-level of their basin.

With regard to the nature of the grade thus established Professor Davis says:

> The actual slopes of the different parts of a graded river system vary from a faintest declivity in the lower course of the trunk river to decidedly steeper declivities in the uppermost courses of the headwater streams.

One of the most important parts of this article is the extension which Professor Davis makes of the use of the idea of an establishment of grade from the stream-course itself to the hillsides. He had previously brought this point forward, but the present article contains an excellent statement of this very important idea. The point is that, wherever the land is wasting away, there is a cycle of development in progress, and that the course pursued in this development is essentially the same in the streams of waste which are moving down the hillsides toward the rivers as in the rivers themselves. The tendency is to establish a grade in the main stream, for this to extend up the tributary streams, and to continue along their numerous subdivisions until the entire area between the stream and its divide has attained a condition of established grade.

Employing the term *waste-streams* for the slow hillside movement of soil, Professor Davis compares their development to that of rivers, as follows:

> The first development of the balanced or graded condition in waste-streams usually takes place on the outcrops of the weaker rocks that are exposed on freshly-cut valley sides. Here graded waste slopes are locally developed; the adjoining waste-streams form a sheet or cloak of waste which creeps slowly down the slope, while untamed ledges of harder rocks are still kept bare by the removal of waste from their surface as fast as it is formed. These represent the falls and rapids of water streams, because the waste from above the ledges passes over them quickly; while the graded waste-covered slopes represent the graded reaches of water streams, where the movement is more regular and leisurely. The less resistant of the bare ledges are the first to retreat under cover, permitting the grades below and above to unite in a single continuous slope; and so on until all ledges are concealed under a graded sheet of waste, and the sharp, vigorous forms of youth and early maturity merge into the subdued and tamed forms of passing maturity and approaching old age. During the progress of this change there may be abundant examples of captures of one group of waste streams by the leading members of another group, especially in regions of tilted strata; thus increasing the resemblance to waste-streams and water streams until one is tempted to regard the difference between them as one of degree rather than of kind. . . . It is always with reference to the graded course of the main river that the side streams are graded; it is with reference to all the graded streams that the slopes of the interfluves are graded.

As Professor Davis himself says, it is more doubtful whether physiographers will accept his proposition regarding the usage of the terms denudation and degradation than the other points that he

raises. Yet, notwithstanding the entirely new meaning which he proposes for these terms, there is something very attractive in his suggestion. Moreover, by the usage which he proposes there will be a distinct relation between the meaning of the words and their applications to physiographic phenomena. His proposition is as follows:

> Denudation might be advisedly used as the name of those active processes, chiefly operative in the youth and maturity of a cycle, by which rock structures are laid bare, literally denuded, because their waste is removed as fast as it is formed. Degradation, on the other hand, is more appropriately associated with those leisurely processes, characteristic of the later stages of the cycle, in which a graded slope is reduced to fainter and fainter declivity, although maintaining its graded condition all the while. Aggradation is naturally the opposite of degradation, and implies the deposition of rock waste by transporting agencies, the built-up surface being always kept essentially at grade. Thus defined, denudation would accompany the early work of downward corrasion by streams, and the longer-lasting work of valley widening by weathering and washing. It would be systematically transmuted into degradation as the processes that operate on the various lines of down-slope streaming attained the graded condition—the large rivers first, the smaller branch streams later; the headwater streamlets and the hillside waste-streams later still. Retreating cliffs and summit ledges, the last strongholds of denudation, would pass into the phase of degradation when they are reduced under the graded waste-cover in the stage of subdued relief, characteristic of late maturity and early old age, and thenceforward all further erosion would be by degradation alone.

Nearly every point in this article by Professor Davis is worthy of the most careful attention of physiographers, and cannot help having a very decided influence in establishing a more careful usage of the terms discussed, besides clearing up from the minds of many those difficulties in the interpretation of facts which have arisen partly through a lack of consistent usage of these common and now well-established terms.

Geology of Northeastern Labrador.—In a paper describing the results of a summer excursion to Labrador (*Bull. Museum Comparative Zoology*, Vol. XXXVIII, pp. 205–270), Dr. R. A. Daly makes the following statement regarding the mountains of the extreme northeastern part of Labrador between Ungava Bay and the ocean:

> The Torngats afford a field of operations which it will take many seasons even to reconnoitre. In the last-mentioned range are the highest mountains on the Atlantic seaboard of America, unmeasured and almost entirely unnamed. It would be of much importance to fix the elevation of the highest post-glacial shore-line in the interior of the peninsula as well as on the south coast, in Newfoundland, Cape Breton, and across Hudson's Strait, where isolated observations have already been made.

This remark is less true than it was before Dr. Daly's paper was published, for he has given us some important results upon the

geology and geography of the Labrador coast, including some important observations in the Torngat mountains.

Daly shows that there are evidences of marked glacial erosion on the Labrador coast, and some of the hanging valleys are described and pictured. His descriptions of certain of the fjords, and the interpretation which he places on their history, are among the best that have been given for the northeastern American coast. Daly also brings forward facts to prove the earlier conclusion of Lieber and Bell, that these lofty mountains rose above the ice-sheet of the Glacial Period. No erratics could be found above an elevation of 2,050 feet; but below this level there has been vigorous glacial erosion, proved by erratics and other forms of glacial deposits, roches moutonnées forms, and other signs of glacial erosion. His conclusion on this point he states as follows:

> Taking the Nachvak region as a sample of the whole of the higher Torngats, the general conclusion is that these mountains have not suffered, during the last advance of the ice-cap, even the limited amount of glacial erosion that may be discerned on the summits of Mt. Ktaadn, the Presidential range of New Hampshire, Ben Nevis and the neighbouring peaked mountains of the western Scottish highlands, or the ragged outliers of the Scandinavian plateau. It is probable that the higher parts of the Kiglapait and the Kaumajet massifs similarly formed nunataks overlooking the late Pleistocene ice-sheet.

Another important feature of Daly's paper is his discussion of the evidence of post-glacial uplift of the land. This he finds to have been differential, the level of the highest marine work between St. Johns, Newfoundland, and Nachvak, in northern Labrador, varying from 575 feet at St. Johns to 250 feet at Nachvak. At Hopedale, more than two-thirds of the way from St. Johns to Nachvak, the highest marine work stands at 390 feet. Daly says that

> Hamilton Inlet owes in part its depth, and, indeed, its very existence as an inlet (it is but 10 fathoms deep at the Narrows), to the fact that the part of the plateau on which it lies has not been elevated as much as the land to north and to south.

Regarding the differential uplift, Daly reaches the following important conclusion:

> If the record of the table be put in graphic form it becomes still more evident that along the eleven hundred miles of coast the elevation has been differential. The pronounced warping of the highest shore-line is incompatible with the view that changes in the position of the level of the sea over great stretches of the earth's surface are produced solely by independent vertical movements of the surface of the ocean. Along the line on which our observations were made there has been unequal positive uplift of the earth's crust. The force responsible for this great piece of work has been applied locally and in varying degree. The result is that to-day the actual distance from the centre of the earth of every point on that line is greater than it was at the close of the glacial period.

One of the interesting suggestions made by Daly is that the elevation in both Labrador and Newfoundland is still in progress. This suggestion is based upon the almost universal evidence of old settlers, who are of the opinion that, during periods of thirty to sixty years, rock ledges have come perceptibly nearer the sea surface, while new channels among the shoals have to be sought by the fishing boats. When, over one hundred and fifty years ago, similar evidence was offered for the coast of the Scandinavian peninsula its value was questioned; but the placing of bench marks has proved the correctness of the evidence, and the changes of level on the Scandinavian coast are now classical in geology. In order to understand the meaning of these movements of the earth's crust, it is highly important that we have other definite records in various parts of the world, and northeastern America seems to offer opportunities for this kind of observation. I wish, therefore, to add my opinion to that of Dr. Daly that this is a direction in which there is an opportunity for valuable work. It would stand to the credit of the American Geographical Society if it should undertake to lay a foundation for future study of this interesting problem.

Loess of Northern China and Central Asia.—The work of Richthofen and Pumpelly attracted such attention to the remarkable deposits of loess in China that any further work upon this subject will be of interest. In his recent trip across the loess country Professor G. Frederick Wright has made some observations and drawn certain conclusions which have recently been published in the *Bull. of the Geological Society of America* (Vol. XIII, pp. 127–138, 1902). Professor Wright looked in vain for evidences of extensive glaciation, and the absence of such evidence leads him to conclude that the Chinese loess cannot be ascribed to fluvio-glacial origin, as has been suggested. The presence of boulders and gravel beds, and the existence of apparent terraces, have led him to the conclusion that the

> present distribution of loess over northwestern China was mainly secured by the agency of gradually-receding water, the presence of which would be obtained by a temporary general depression of the land about 3,000 feet.

It is his opinion that a vast area, extending from the Black Sea almost to the Pacific, and reaching from the Arctic to below the Caspian, was submerged for a brief period during the latter part of the Tertiary, possibly contemporaneously with the uplift of northwestern Europe and northeastern America. That Professor Wright does not entirely discard the agency of the wind is shown by his closing sentences, as follows:

The discussion should not be closed, however, without remarking that ample credit must still be given to the wind as an agency which is still at work distributing the loess and producing many minor modifications which are plainly visible in northeastern China, where many of the extensive deposits are clearly drifted material brought in by the wind in recent times. This may be freely granted without admitting that wind is competent to account for all the phenomena presented.

ORIGIN OF ESKERS.—The origin of these interesting forms of deposit, associated with the retreat of the continental glacier, has given rise to much discussion. Two explanations stand prominently before glacial geologists, one accounting for them as subglacial stream beds, the other explaining them as deposits in ice gorges on the surface of the glacier. The latest contribution to this discussion by Professor W. O. Crosby (*American Geologist*, Vol. XXX, pp. 1–39), while admitting the probability that eskers are in some cases due to deposits in subglacial streams, argues against this hypothesis as a general explanation, and brings forward facts and arguments for the superglacial hypothesis. Crosby's article ranks with Stone's monograph (The Glacial Gravels of Maine, etc., Monograph 34, United States Geological Survey) as one of the most important American contributions on the subject of eskers.

Crosby shows that existing glaciers and ice-sheets throw very little light on the question. He then states the characteristics of eskers, and follows this with a consideration of the probable condition of the ice-sheet during the formation of eskers. His view on this point is briefly stated in the following summary:

To summarize, it appears probable that eskers were formed in connection with the sluggish or wholly stagnant marginal portion of the waning ice-sheet, after the liberation by basal melting of all that part of the ground moraine, including drumlins, showing evidence of having been pressed down and compacted by the movement as well as by the dead weight of the ice; and after the upper part of the englacial drift had become superglacial through the superficial melting or ablation of the ice. Such crevasses as may have survived the cessation of flow, or resulted from local subsidence due to basal melting, were probably closed by drift washed into them from above. The general absence of modified drift, interstratified with the till, is an indication that subglacial streams or a concentrated flow of subglacial waters did not exist before the ice became stagnant, the only explanation that suggests itself being that while the ice was in motion it would cause the drift to rise and fill any channel opened above it—a principle which is not operative beneath alpine glaciers (and possibly not beneath the Malaspina glacier), because they have long since swept their channels free of drift.

This preliminary statement is followed by an extensive discussion of the two leading hypotheses, the result of which may be inferred from the following:

Although recognizing, as previously stated, that other explanations, such as the filling of abandoned channels by surface slide and wash, are entitled to some consideration, and that they are all, probably, essential to the complete theory of eskers,

it is proposed in what follows to take account only of the two main hypotheses, viz., that eskers have been formed by the active agency of subglacial streams, or of superglacial streams. And here, again, as already noted, it is merely a question of relative importance, since I hold with Davis and other advocates of the subglacial hypothesis that neither can wisely be discarded *in toto*. Subglacial tunnels are a reality at the present time, and were, doubtless, to some extent a feature of the Pleistocene ice-sheet; and it would certainly be hazardous to deny that deposits formed in them have never escaped obliteration on the disappearance of the ice.

While this is the strongest argument in favor of the superglacial origin of eskers, there are some points in the discussion to which many glacial geologists will not agree. The chief objection to the superglacial hypothesis is the fact that it requires the existence of a large amount of englacial drift—far more than seems possible from the evidence that has been brought forward. Another objection is the question whether, if superglacial eskers were formed, they could be lowered to the ground on the melting of the ice in the manner which Crosby proposes.

Pleistocene Geology of Western Long Island.—The first published results of the work on the Pleistocene geology of eastern New York, which Professor J. B. Woodworth has undertaken for the State, appears (*Bulletin 48, New York State Museum*) under the title of "Pleistocene Geology of Portions of Nassau County and Borough of Queens." The discussion of the Pleistocene history of a section so near the City of New York possesses more than ordinary interest. The paper gives detailed descriptions of the glacial deposits of the section, and is illustrated by maps, photographs, and drawings. In brief summary, the history of the region is as follows: Relatively early in the Glacial Period western Long Island received a thick coating of gravels and sands, some of them borne from the mainland on the north. Somewhere near the middle of this period there was an actual invasion of ice, either floating ice or land ice, laying down beds of till. These deposits are apparently to be correlated with the Columbia formation of McGee. It is not certain just what the level of the land was at this time, but after the deposition of these beds they appear to have been somewhat dissected by stream action,

indicating an epoch of deglaciation or ice retreat of indefinite duration.

Two lines of moraine were then laid down, the outer or more southern one being the earlier. At the time of this moraine formation the elevation of the land above sea-level appears to have been as high, if not higher, than at present;

and during the retreat of the ice one or more temporary lakes existed back of the moraine, first at 80 feet above the present sea-level, then possibly at about 40 feet.

The period of morainic formation and accompanying lacustrine areas is correlated with the Wisconsin or last glacial epoch. After this the ice withdrew across East River, and since that time Long Island has been free from direct influence of the Glacial Period.

Certain features of detail are also explained in Woodworth's paper; for example, the small lakes and tarns, such as Lake Surprise. Some of these exist in the moraine, and in some cases the depressions are evidently due to the melting out of ice blocks left in and under the glacial deposits. The streams of the Long Island plain flow in courses which were carved out by

vigorous glacial streams or in still older channels on the north side of the moraine. Owing to the porosity of the glacial gravels, much of the rainfall soaks into the ground and issues near sea-level in the form of springs; hence, since the run-off is small, little erosive work has been accomplished in the post-glacial epoch.

Woodworth infers post-glacial subsidence from the fact that there are no wave-cut terraces, as one would expect, behind the barrier beaches. He believes that they have been carried below sea-level by subsidence. Beds of peat suggest the local depression of the shore-line.

The features summarized above are fully developed in the paper, and an accompanying map shows in detail the distribution of the glacial deposits. This paper will not only be of interest to students of glacial geology, but also of much use in the schools of the Borough of Queens and vicinity.

Pleistocene Geology of Western New York.—A recent paper by Fairchild (20th report of the New York State geologist, 1900, pp. 105–139) describes and maps a portion of the Iroquois shoreline and gives facts, with numerous illustrations, concerning the overflow channels connected with the withdrawal of the ice-sheet from northern New York. These channels, as recognized by Gilbert, have an important bearing on the detailed history of the glacial lakes which existed in New York while the ice-sheet dammed the present outflows.

GEOGRAPHICAL RECORD.

THE WEST INDIES.

RENEWED VOLCANIC ACTIVITY.—The succession of violent eruptions of Mont Pelé, following the destruction of St. Pierre, Martinique, on May 8 last, culminated on August 31, after a period of comparative quiescence, in a terrific outburst, that laid waste a far larger area than was embraced in the district devastated on May 8. Professor Angelo Heilprin writes from Martinique that the destructive blast, instead of confining itself to a section (mainly west and southwest of Mont Pelé in the first eruption), was distributed radially, crossing the low summit of the volcano near the knob of Morne Jacob, and skipping zones between its rays. The area of destruction was distributed all over the northern end of the island, with the volcano approximately at its centre. A number of towns were destroyed, including Morne Rouge. The victims are believed to number about 2,000, death resulting, in most cases, from contact with the terribly swift and hot blast, which burned and suffocated. The electrical illuminations during the storm were remarkable. Perhaps no position in the north of the island is safe. The Government has ordered the evacuation of all points within a radius of about eight or ten miles of the crater. A very violent eruption of La Soufrière, St. Vincent, occurred on September 3.

AUSTRALIA.

IRRIGATION IN AUSTRALIA.—For several consecutive years Australia has suffered severely from drought. The evil effects have naturally been cumulative, and Australian newspapers say that, unless relief speedily comes, years will elapse before the agricultural and stock-raising interests of the Commonwealth can regain the prosperity they enjoy under more favourable conditions of climate. The development of the irrigation by means of artesian wells is in constant progress, but this resource is as yet adequate for the needs of only a small part of the fields, flocks, and herds. The following facts are condensed from a paper on the economic geography of Australia, by Dr. Max Wiedemann, published in the *Verhandlungen* of the Berlin Geographical Society (1901, Nos. 8 and 9).

The river systems of the continent cannot be depended upon to supply much water for irrigation, because most of the tributaries of

the large rivers, owing to evaporation and percolation, are waterless, or nearly so, for many months in the year, with the result that the stage of water in the main rivers is very low during the summer and autumn. There would now be very little irrigation if it had not been discovered that a great deal of the precipitation is not evaporated, but sinks through permeable strata to artesian reservoirs of varying depths. The large and small irrigation enterprises depend mainly upon tapping these reservoirs.

The work of boring artesian wells, begun in New South Wales in 1881, has been largely developed in Queensland, both at public and at private expense. Queensland has now about 350 artesian wells, extending in the form of a half circle through the middle part of the inland high plain. This line of wells stretches north and northwest from the upper course of the Darling to Hughenden, and then south and southwest to the sources of Diamantina Creek, where it ends. The larger part of the Queensland wells are along this half circle, where the depth of the borings varies from 100 to nearly 1,000 feet; but in some places the borings have been sunk to depths of 1,800, 2,500, and 3,000 feet. The water-yield varies greatly; the majority of the wells supply each 100,000 or more gallons a day, and some wells yield one, three, and four million gallons a day.

There are fewer artesian wells in New South Wales, most of them being along the Darling river, near Bourke, and on the middle Macquarie, near Warren. Comparatively few wells have thus far been sunk in the States of Victoria, South Australia, and West Australia. Much more artesian water is used for the flocks and herds than is spread through the grain fields and fruit farms. No attempt has yet been made to water extensive areas, as has been done in California. It remains to be proved whether the underground sources will supply so much water that large areas may be made highly valuable, as in the fruit region of southern California; but at any rate, through the provision of abundant supplies of drinking water a wide extent of formerly useless country has been opened to stock-raising.

AFRICA.

SOUNDINGS IN LAKE NYASSA.—Lieutenant Rhoades, of the British Navy, has supplemented his careful survey of the coast-lines of Lake Nyassa by an extensive series of soundings that have revealed the general conformation of the lake bottom. It is found to be fairly level over large areas, especially in the northern part of the lake. The depths vary more or less in accordance with the steepness of the coast-lines, being greatest in those parts of the rift valley where

the sides have the character of fault-scarps. The soundings of from 100 to 200 fathoms cover about two-thirds of the lake's area, the maximum depth found being 386 fathoms. If greater depths are found they will indicate only a narrow trough or depression of limited area. The nature of the bottom, recorded at each sounding, was nearly everywhere mud, with black sand and rock, found only in small areas. Nine sections across the lake, drawn along the parallels of latitude at intervals of thirty geographical miles, indicate, in a general way, the actual contour of the lake bottom. This explorer's map of Lake Nyassa, based upon his survey of the coast-lines, was published in the *Geographical Journal* in December, 1898; the map, showing the results of his soundings, appears in the same publication (July, 1902). As they are a decided advance on all earlier maps of the lake, they are to be recommended to cartographers.

THE CAPE TO CAIRO RAILROAD.—The London *Times* announces that the section of the Cape to Cairo railroad, from Bulawayo to the Zambesi river, 275 miles in length, is expected to be opened next year. Trains will then run from Cape Town to the Victoria Falls of the Zambesi—a distance of nearly 1,700 miles. The route has been surveyed as far as Victoria Falls, where a long steel bridge, having one span of 500 feet, will carry the line across the Zambesi. On this northern section the earthworks are practically completed for fifty miles, bridges are building, and rails have been laid for several miles. Meanwhile the preliminary steps are being taken to build the line north of the Zambesi, and a survey party has been sent over the route beyond Victoria Falls as far as Lake Tanganyika.

The railroad extending northeast from Bulawayo to connect that town with Salisbury, the chief station in Mashonaland, is also making rapid progress. The road is building both from Bulawayo and Salisbury, and, when the sections are united, Bulawayo will have another outlet to the sea by way of Salisbury and the Portuguese port of Beira, which now has rail connection with Salisbury.

STUDYING THE LAKE CHAD REGION.—Since the success of the French campaign against Rabah, who had for years controlled the region of Lake Chad, the French have been engaged in pacifying and organizing the country, and at the same time preparing to make a scientific study of this central portion of the Sudan. An expedition has been sent under the command of Professor A. Chevalier to Lake Chad and its greatest tributary, the Shari river, to study in detail the natural resources of the country and the prospects for commercial development. It is expected that the party will be in the field at least two years.

MAJOR AUSTIN'S JOURNEY FROM OMDURMAN TO MOMBASA VIA LAKE RUDOLF.—*The Geographical Journal* has published (June, 1902) Major Austin's narrative of this very remarkable journey, involving the greatest hardships. The journey occupied from December 15, 1900, to August 26, 1901, and covered 2,400 miles of travel, by steamboat on the Nile and Sobat, a land march from the Sobat to the Uganda railroad at Lake Nakuro, and thence by rail to Mombasa. The land march, about 1,200 miles, occupied from January 14 to August 21, during which time the expedition, numbering sixty-two men, with camels, mules, and donkeys, was threatened with destruction by thirst, hunger, and hostile natives. As it was, two-thirds of the black personnel was lost. The expedition followed the west shore of Lake Rudolf for about two-thirds of its length. The general direction of the journey on the Nile steamboats was south; that of the land march and the railroad journey, southeast.

The country through which the expedition marched from Fort Nasser, on the Sobat, to the Uganda railroad, has a few distinctive geographical features. Beginning the land march, the party left behind the swampy regions of the Nile. Far to the east, and extending north and south, were the Abyssinian highlands, glimpses being obtained in February of the lofty mountains that crown them. Though at a great distance, Major Austin was able to fix approximately the heights of some of the mountains, the loftiest being over 8,000 feet, and others from 7,000 to 8,000 feet, above sea-level. Between this Abyssinian plateau and the Nile is a plain several hundred miles in width, comparatively level in large areas, swampy along the rivers, and here and there interspersed with small ranges of mountains rising abruptly from the surrounding country. The zone of scanty rainfall—due, it is supposed, to the condensation and precipitation of most of the water while the rain-clouds are passing over the Abyssinian highlands—was entered a little south of 6° N. Lat.; here are regions of waterless desert, bordered, however, by some mountain districts with summits from 3,000 to 6,000 feet in height, which condense considerable water vapour and show expanses of fertile soil. The Omo river, which empties into the north end of Lake Rudolf, and is the only perpetual feeder of the lake, is the finest river in this part of Africa. Its banks are covered with excellent timber, and parts of the valley are extensively cultivated. Swamps, plain, desert, detached mountain ranges, and some not very extensive wood lands are the characteristic features of the country from the Nile to the fine high-

lands of British East Africa, among which the land journey came to an end.

The country traversed is rather sparsely peopled, and the natives are suspicious and very shy, which is not to be wondered at, as they are constantly raided by the Abyssinians. Quite a number of stragglers from the expedition were speared to death by hostile natives, who sometimes followed the party for days. After the failure of food supplies, nearly all the donkeys and camels were eaten, and at some critical periods it seemed as though all the members of the party were destined to perish.

POLAR.

THE BRITISH SOUTH POLAR EXPEDITION.—The steam yacht *Morning*, purchased and fitted out by the Royal Geographical Society at a cost of over $100,000, sailed from the Thames on July 9 *en route* for New Zealand, whence she will depart for Victoria Land to carry supplies to the British expedition on the *Discovery*. A freezing-chamber, built on deck, will be filled in New Zealand with mutton, so that the explorers of the advance expedition may have a supply of fresh meat. Other provisions and a large quantity of coal will also be taken to the *Discovery*. The *Morning* is under the command of Captain Colbeck, of the Royal Navy Reserve, who had charge of the observations on the Southern Cross expedition to the Antarctic. He has twenty-eight men in his crew. Although the main object is to act as a tender to the advance party, the *Morning* has a scientific equipment, and is expected, as far as possible, to supplement the work of the *Discovery*. If the *Discovery* is not found on the east coast of Victoria Land, the *Morning* is not to follow her into unknown regions, but to cache the supplies at Capes Crozier and Adair and Wood Bay, and return to Lyttelton, N. Z., where she would be expected to arrive in March or April next year.

THE BALDWIN-ZIEGLER EXPEDITION TO FRANZ JOSEF LAND.—This party, which was fitted out at great expense in 1901 to undertake the discovery of the North Pole, with Franz Josef Land as a base of operations, has returned to Europe at the end of its first year without having advanced beyond the known regions of that archipelago. It established three depots of food supplies north of Camp Ziegler, the winter quarters, but in this work most of the dogs died, and the sledges were destroyed; and the depletion of the food supplies and coal remaining at Camp Ziegler led to the return of the expedition.

SVERDRUP'S ARCTIC WORK.—The *Fram*, Captain Otto Sverdrup, returned to Norway in September, after four years of Arctic service. Captain Sverdrup's telegraphic report of his work (London *Times*, Sept. 22) shows that the expedition was very successful in making new discoveries along the south coast of Ellesmere Land and the west coast to lat. 81° N., a little beyond Greely Fiord; also new islands were discovered in the hitherto unknown area north of the Parry Islands. The work cannot clearly be described until the publication of Sverdrup's map, when it will be easy to trace the extent of coast-lines, the ramifying fiord systems, and the new islands he has discovered. It will suffice in this place to indicate the main features.

The earlier reports, that a large part of southern Ellesmere Land is covered by an ice-cap, are confirmed by Sverdrup's sledge journeys. Another journey across Ellesmere Land further north was across country free from ice.

The south coast of Ellesmere Land extends further to the west than it is represented on the maps. The sound between North Kent Island and Ellesmere Land is, therefore, narrower than it was supposed to be. The current through this sound is rapid, and passage was not easy either by open water or when it was filled with rugged ice.

On the west coast of Ellesmere Land, north of the sound, between Ellesmere Land and North Kent, is a large bay, extending eastward, and 100 miles in breadth. On the north side of the bay, about 50 miles east, are large fiords; north of the bay the coast runs in a north and northwesterly direction, and is very hilly and intersected by large fiords, some of which are 15 to 20 miles wide at the mouth. Above the 81st degree the land extends in a northerly direction.

Various islands were discovered to the north of North Cornwall. The south coast of one of them was followed westward, then northward, then in a northwesterly direction to lat. 79° 30′ N. and long. 106° W., when the land turned eastward and southward. No other land could be seen from the west or north coasts. Only the rough ice of the Polar Sea spread away in these directions.

The *Fram* spent the winter of 1898–99 frozen in the ice in Smith Sound; that of 1899–1900 in Jones Sound, and the winters of 1900–01 and 1901–02 near the southern end of Cardigan Strait, further west.

A MAGNETIC SURVEY OF INDIA.—The Government of India has decided to carry out a magnetic survey of that country under the direction of Colonel Gore, the Surveyor General, and Mr. John Eliot, the

official meteorologist. The undertaking was suggested by the Royal Society in view of the tentative hypothesis advanced by Sir Norman Lockyer that sun spots have an influence not only upon the magnetic forces of the earth but also upon meteorological phenomena, and, therefore, indirectly upon the great famines that afflict India (*Peterm. Mitt.*, 1901, p. 214).

A PUBLICATION under the title: Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität, Berlin, edited by Dr. von Richthofen, is to be devoted to wide aspects of oceanography. It will appear at irregular intervals, and without arrangement in volumes. The first to be printed is "Deutsche Südpolar-Expedition auf dem Schiffe Gauss unter Leitung von Erich Drygalski." Later issues will contain "Die nordwest-europäischen Welthäfen in ihrer Verkehrs- und Handelsbedeutung," by Dr. K. Wiedenfeld, and "Untersuchungen über den Einfluss des nordatlantischen Ozeans auf die Witterungsanomalien der nördlichen Hemisphäre," by Dr. W. Meinardus.

THE STUDY OF THE SEA.—For three years plans have been forming for international participation in the study of the sea and fisheries. The special field of study will be the seas along the northwest and northern shores of Europe. All the North Sea Governments are to take part, excepting France.

The first meeting of delegates from the countries interested was held in Stockholm in July, 1899; the second in Christiania in May, 1901, and the third at Copenhagen on July 22 last, when the International Council for the Study of the Sea was organized. The delegates were scientific men from the various countries, Germany being represented by Dr. Herwig, President of the German Sea Fisheries Association, and Prof. O. Krümmel, of Kiel; Great Britain by Sir Colin Scott Moncrieff and Prof. D'Arcy Thompson, accompanied by Dr. H. R. Mill and Mr. W. Garstang, as expert advisers; Holland by Dr. P. P. C. Hoek; Denmark by Captain Drechsel and Drs. Knudsen and Petersen; Norway by Dr. Nansen and Dr. Hjort; Sweden by Dr. O. Pettersson and Dr. Tryhom; Russia by Dr. Knipovich, and Finland by Prof. Homén and Dr. Nordqvist.

The *Geographical Journal* (Sept., 1902) says that the recommendations of the Christiania conference for oceanographical work (*Bull. Amer. Geog. Soc.*, 1901, p. 353) were adopted, with a few slight variations. The principle of simultaneous observations four times a year as the basis of a system of regular observations of temperature, density, and plankton was approved.

The ships which Great Britain will devote to the work will make periodical trips in the Faroe-Shetland Channel and across the north end of the North Sea, working from a central harbour in Shetland; also simultaneous trips in the west part of the English Channel. The Dutch will take the southern and the Germans the northern half of the North Sea; Denmark will investigate the waters between Faroe and Iceland; Norway will take the North Atlantic off the western seaboard of Scandinavia; Russia will do similar work along the Murman coast and across Barents Sea to Novaya Zemlya; while the Baltic will be studied in detail by Danish, Swedish, Finnish, Russian, and German vessels. It is intended to connect these periodical trips with observations at fixed stations, such as light-ships, and also to co-operate, as far as surface observations are concerned, with regular lines of steamers crossing the North Sea and the Atlantic.

Among the leading questions to be studied will be the migrations of such fish as the cod and the herring; the whole question of over-fishing in the parts of the North Sea most frequented by trawlers will be carefully investigated. This question deals with the possibility of the resources of the sea becoming exhausted by continuous fishing, and the report upon it may afford a basis for international action in protecting threatened areas. All publications will be issued at Copenhagen, the seat of the Central Bureau of the Council, of which Dr. Herwig is president. The International Laboratory has been established at Christiania, with Dr. Nansen as honorary director and Dr. Walfrid Ekman as assistant for physical work. It was recommended that the laboratory be opened in October, and that the periodical cruises begin, at the latest, in the spring of next year.

GENERAL.

Reforming the Japanese Script.—The opinion is constantly growing in Japan that the Chinese script, used in the written language of Japan, impedes the efforts to reach the intellectual plane of the most advanced nations. A movement in favor of substituting the Roman script was started in 1885 by the Romaiji-Kwai, a society organized to promote the reform. Little ground was gained, however, and the society was dissolved after printing a periodical in Roman type for a number of years. A new movement, in progress since 1899, under the direct encouragement of the Department of Education, aims at the gradual suppression of the Chinese script, the chief means of effecting this end being to teach the school

children to read the Japanese written language in Roman type. A more far-reaching movement still is that which aims ultimately at the fusing of the spoken and written languages, so that the literary and colloquial tongues shall be practically the same, and expressed on the printed page in Roman type.

A NEW HOUSE FOR THE ROYAL GEOGRAPHICAL SOCIETY.—In his recent address before the Royal Geographical Society (*The Geog. Jour.*, July, 1902), the President, Sir Clements R. Markham, said that, having equipped and despatched an expedition for South Polar research, the next work would be the building of a new and much-enlarged home, to replace the cramped quarters to which the Society has long been confined. The library is overflowing into every room, it is increasingly difficult to find space for the map collection or to make the maps accessible, and the work of the draughtsman and other employees is embarrassed by lack of room. He felt confident that the Fellows would support the Council when it should adopt measures for the erection of a more adequate building.

NOTES ON CLIMATOLOGY.

BY

ROBERT DEC. WARD.

THE RELATIVE HUMIDITY OF OUR HOUSES IN WINTER.—While it is generally agreed that the air of our furnace-heated houses is much too dry in winter, few persons realize what the amount of moisture in this air actually is, and how it compares with that in the air under certain natural conditions out of doors. In the *Journal of School Geography* for September, R. DeC. Ward has a short article on "The Relative Humidity of our Houses in Winter," in which the results of some simple observations along this line are given. The observations in question were made by means of a sling psychrometer in the writer's study, which is heated by an ordinary hot-air furnace, provided with the usual small evaporating pan. From three to five observations were made daily during three weeks in the month of November, each observation including the temperature of the room, the relative humidity within the room, the temperature and relative humidity of the outside air, the amount of ventilation by means of the windows, and the quantity of heat coming from the furnace.

The mean relative humidity for the whole period of three weeks was 30%. The mean relative humidity of the outside air was 71%, or 41% in excess of that indoors. The maximum relative humidity indoors for a whole day was 40%, recorded on a rainy day, with the window open, and with a moderate fire in the furnace. The relative humidity outdoors on this same day averaged 87%. The minimum relative humidity for a whole day was 24% indoors, the weather being clear and cold, and the windows shut most of the day. On this same day the relative humidity outside averaged 51%.

Comparing the relative humidity of the room in which the observations were made with that of the outside air in different places, we find the following facts: For almost all of the United States east of the Mississippi river the normal annual relative humidity is between 70% and 80%, and it is only in the southwest (New Mexico, Arizona, and southern Nevada, Utah, and Colorado) that the annual mean is below 50%. The lowest mean annual relative humidities in the United States are those for the Weather Bureau stations

in the dry southwest. Yuma, Ariz., has a mean annual relative humidity of 42.9%, with a mean monthly minimum of 34.7% in June. Santa Fé, New Mexico, has a mean annual of 44.8%, with a mean monthly minimum of 28.7% in June. Pueblo, Colo., has a mean annual of 46.2%, with a mean monthly minimum of 37.6% in April. Death Valley, Cal., was found to have a mean relative humidity of 23% during five months (May–September) of the year 1891, when a temporary meteorological station was maintained there by the United States Weather Bureau. During this same period the mean temperature was 94°.

Southwestern Siberia and western Turkestan have a mean relative humidity of 45–50% in July. Yarkand, in eastern Turkestan, has a July mean of 47%. In the arid region in the neighbourhood of the Sea of Aral, Nukus (lat. 42.5° N., long. 59.6° E.), has a June mean of 46%, and a 2 P.M. June mean of 19%. Petro-Alexandrovsk, a degree and a half east of Nukus, in the desert (lat. 41.5° N., long. 61.1° E.), has a mean of 34% in June. Kasalinsk (lat. 45.8° N., long. 61.2° E.) has a mean of 45% in July. The air is still drier in the deserts near the equator. Ghadames, in Tripoli, has 27% in July, and 33% in August, and the Kufra Oasis has 27% in August, with a 3 P.M. August mean of 17%. In the Punjab and northwestern India, Lahore has 31%, and Agra has 36%, in May.

These data show that the air of the room in which the observations were made, and which may be taken as fairly typical of the air in most rooms in which we live and work in winter, was drier than that of many desert regions. That so dry an atmosphere is not healthy, especially in our winter climate, there is no need of argument to prove. The low relative humidity means excessive evaporation from skin, lungs, and respiratory passages. Catarrhal affections, and other throat difficulties, may easily follow. Furthermore, the strain which is put upon the body in the rapid adjustment which it has to make when we go out from the high temperatures and desert aridity of our houses in winter into a temperature, it may be 70°, 80°, or even 90° lower, and a relative humidity of 70 to 100%, is a very great one. As long as the air in our houses is so very dry, most persons are not comfortable unless the thermometer records about 70°, or even more. The dry air involves rapid evaporation from the surface of the body, and this means that we feel cool. Hence the desire to have our room temperatures kept well up to 70°, when, if the air were reasonably moist, we should feel comfortable at 65°, or thereabouts.

RAINFALL VARIATIONS.—A valuable study of the variations of rainfall during long periods of time has been made by Professor Hann, of Vienna, in a paper entitled "Die Schwankungen der Niederschlagsmessungen in grösseren Zeiträumen" (*Sitzungsber. Wien. Akad. Wiss.*, *CXI*, 11a, 1902). In this discussion the data used were the monthly and annual mean rainfalls of Padua (from 1725 to 1900); Klagenfurt (from 1813 to 1900), and Milan (from 1764 to 1900). For the past hundred years (1801 to 1900) the annual extremes expressed in percentages of the general mean are as follows:

	PADUA.	KLAGENFURT.	MILAN.
Driest year.....	58	42	62
Wettest year.....	152	151	152

If the wet and dry years of the last century are classified according to their percentage departures from the general mean, the following table is obtained:

Character.....	Very dry.	Dry.	About normal.
Per cent	51–70	71–90	91–110
Number.....	8	26	37
Character.....	Wet.	Very wet.	Extraordinarily wet.
Per cent	111–130	131–150	over 150
Number.....	22	6	1

The dry years are seen to number 34 per cent., and the wet years 29 per cent. The rainfall of the wet years, however, departs to a greater extent from the mean value than does that of the dry years. When the mean epochs of these dry and wet periods are determined, it appears that they show a 35-year periodicity, the maxima and minima coming in the following years:

Wet.....	1738	1773	1808	1843	1878	(1913)
Dry.....	1753	1788	1823	1859	1893	(1928)

This period corresponds with the 35-year period of Brückner.

BLUE HILL OBSERVATIONS FOR 1899–1900.—A record of good work continued, and of the successful prosecution of studies along new lines is evidenced in the "Observations and Investigations made at the Blue Hill Meteorological Observatory in the Years 1899 and 1900" (*Annals Harv. Coll. Obsy.*, LXIII, Pt. II, 1902). The contributions to meteorology which have been made by the meteorologists of the Blue Hill Observatory are well known the world over. A striking bit of evidence as to this fact is contained in the bibliography of the most important articles relating to the Observatory

and its work, published by members of its staff and others during the last five years, in which it will be seen how widely the Blue Hill publications are read, and how highly they are valued, by noting the numerous reviews that have appeared of these contributions to science. The present volume contains the regular observations for 1899 and 1900; a summary for the lustrum 1896–1900; an interesting discussion, by Mr. A. E. Sweetland, of the visibility of distant objects as affected by meteorological conditions, based on five years' observations, and a discussion, by the same writer, of the temperatures recorded at Milton during the past fifty years. These two discussions are naturally chiefly of local interest, but they show that every opportunity to advance the science of meteorology is made good use of at Blue Hill.

The greatest work which the Blue Hill Observatory, through Mr. A. Lawrence Rotch, its energetic proprietor, now has in hand is the exploration of the free air over the oceans by means of kites flown from the deck of a steamer. None of the numerous scientific expeditions of the present time promises to yield such a rich harvest of meteorological discovery as this marine expedition which Mr. Rotch has planned, and proposes soon to carry out.

MR. PEARY'S RETURN.

The many friends of Civil Eng. R. E. Peary, U. S. N., and the public generally have been very much gratified by his safe return from North West Greenland, where, since the summer of 1898, he had been pursuing his latest series of explorations. Mrs. Peary and her daughter went north last summer on the *Windward* to bring the explorer home. He was found, as expected, at Payer Harbour, near Cape Sabine. The party, including Matt Henson, returned on the *Windward*, arriving at Sydney, C. B., on Sept. 18. All were well.

Mr. Peary sent to the Peary Arctic Club the following report of the work of his expedition since August 9, 1901:

Left Erik Harbor, on the Ellesmere coast, August 29 [1901]. The party reached Payer Harbor September 16, crossing Roose Bay partly by sledge and partly by boat, then walking across Bedford Pim. About a week later my Eskimos began to fall sick, not one escaping. By November 19 six adults and one child were dead; nearly all the others very weak, but out of danger. Early in January Eskimos came across from Anoritok, bringing news of the ravages of a fatal epidemic through the tribe. Word was sent back by these scouts for as many of the survivors as could come to me, and, by the end of the month, they began arriving.

In February a large depot of dog-food was established near Cape Louis Napoleon, some sixty miles north of Sabine. On March 3 my advance party of six sledges, in charge of Henson, left for Conger. March 6, starting with the main party of sixteen sledges, leaving Percy in charge at Payer Harbor, Conger was reached in twelve marches, arriving within an hour or two of the advance party. My supporting party of Eskimos, returning from Conger, brought down the instruments, chronometers, and Arctic library.

Eight marches more took us to Cape Hecla. The north end of Robeson Channel was all open across to the Greenland coast, lakes of water extending northward as far as could be seen from Black Cape and Cape Rawson. From Hecla another supporting party returned.

April 1, started northward over the Polar Sea with Henson, four Eskimos, and six sledges. Old floes, covered deep with snow and intersected with rubble ridges and lanes of young ice, were encountered from the moment we left the ice-foot. The same kind of travelling, except the lanes of young ice, was found by the English expedition of 1876. After six marches open leads and floes in motion were encountered. Two natives were sent back. As we advanced the floes became smaller, the pressure ridges on a grander scale, and the open leads more frequent. Each day's march was more arduous, and our general course was deflected west by the character of the ice. Finally, at 84.17 north latitude, northwest of Hecla, the Polar pack became impracticable, and further efforts to advance were given up.

New leads and pressure ridges, with foggy weather, made our return, in some respects, more trying than the advance. Hecla was regained April 29, and Conger May 3. Leaving Conger May 6th, Cape Sabine was reached on the 17th. A few days later went north as far as Cape Louis Napoleon to complete the survey of

Dobbin Bay, returning the first of June. A proposed trip across Ellesmere Land westward was prevented by open water at Buchanan Bay.

The ice broke up earlier than in 1901, and Payer Harbor was blockaded almost continuously. The *Windward* bored her way through the ice, and entered the harbor the morning of August 5, and got out again the same afternoon, with scarcely fifteen minutes to spare before the harbor was closed by the ice. Forcing our way across Smith Sound, my Eskimos, with their belongings, were landed at Kangerdlooksoah, in Inglefield Gulf. Several days were devoted to hunting walrus. Then the *Windward* started south, reaching and leaving Cape York the afternoon of August 28. Calling at Godhavn, Greenland, and Cape Haven, Baffin Land, the *Windward* arrived at Chateau Bay, Labrador, September 14, and sent dispatches.

The summer voyage has been without mishap, and the *Windward*, with her new engines, has made as good time as the larger and more powerful ships that have been going north the past ten years.

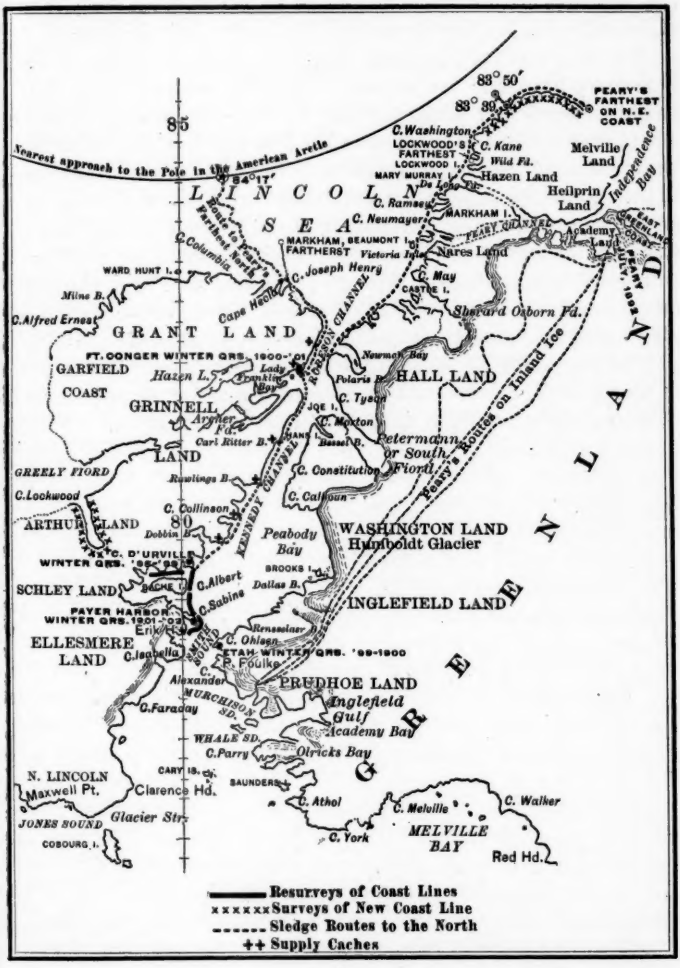
The year at Payer Harbor was passed comfortably, though the anxious strain, caused by the ravages of disease among my faithful people, was not light. Food was abundant, and our supply of musk-ox and deer meat continued throughout the year. The northern sledge trip in the spring was arduous, but not marked by special exposure, suffering, or danger more than is necessarily incidental to serious Arctic work. Equipment and personnel were satisfactory, and further advance was vetoed by insuperable natural conditions.

The *Windward* has on board the instruments, chronometers, and Arctic library abandoned by the Greely Expedition, and numerous specimens of natural history—bear, musk-ox, reindeer, and walrus skins. The skeleton of a two-horned narwhal, a rare Arctic specimen; also living specimens of musk-ox, walrus, Arctic hare, and Eskimo dog are on board. The anchor and chain lost by *Erik* last summer are on board.

The *Fram* left Godhavn about August 20, bound home. She has been in Jones Sound, from whence it is understood explorations were made to the northwest. One death (a fireman) is reported since. Others on board said to be well. The little schooner *Forget-Me-Not*, which was caught in the ice at Cape Haven last year, is now on her way to St. John.

The accompanying sketch map shows the region from Melville Bay to 84° 17′ N., the point Mr. Peary attained last spring in his remarkable sledge journey over the ice of the Arctic Ocean. This is the region in which his great explorations of the past twelve years have been made. As the map is designed specially to show the localities in which he has laboured during his last four years' visit to Greenland, his earlier work is not indicated, excepting his sledge routes over the inland ice between the neighbourhood of Inglefield Gulf and Independence Bay; his earlier work, however, includes surveys of Inglefield Gulf and adjacent coasts, and of the northern and northeastern coasts of Melville Bay, the locating of the Cape York meteorites, hydrographical, glacial, meteorological, and anthropological investigations, and the largest collections, illustrating several branches of science, ever brought from the Arctic regions.

The map shows the locations of the various winter quarters occupied during the past four years; the positions of the food caches, to which were carried by sledge from Smith Sound large



quantities of supplies for northern sledge expeditions; the sledge routes up the channels leading north from Smith Sound, and also around the northern end of the archipelago to the north of Green-

land, and from Cape Hecla over the sea-ice to the most northern point yet attained in the American Arctic. For purposes of comparison, the highest latitudes reached by Markham and Lockwood and Brainard are indicated. The point reached by Peary is fifty-eight statute miles farther north than Lockwood's farthest.

The map also indicates the previously-mapped coasts of which Mr. Peary has made new surveys, and also the new coasts that he has discovered and mapped. Merely the positions of the coasts where these phases of work have been carried out are indicated, as the details of the surveys can be given only on maps of larger scale. A sketch map on a much larger scale, showing the region of intricate channels, penetrating deeply into the land between Cape Sabine and Cape Hawks, resurveyed by Peary, appears in the BULLETIN (1899, opposite page 381). That map also shows the deep inlet (Cannon Bay) south of Greely Fiord, whose extent was discovered by Peary on his sledge journeys of 1898–99.

The map material, resulting from Mr. Peary's long journeys during the past four years, will be of great value for the improvement of the atlas sheets of this portion of the Arctic regions.

NOTES ON ECONOMIC GEOGRAPHY.

BY

ALBERT PERRY BRIGHAM.

FOREST RESERVES.—Part V of the 21st Annual Report of U. S. Geological Survey is devoted to this subject. It well illustrates the widening range of the Survey's work and the sumptuous character of its publications. We have a large volume giving a summary of work during the year 1899–1900, and detailed descriptions of several reserves. The volume is accompanied by a case containing 39 maps. These latter include a general map of the forest reserves and natural parks; and many smaller maps of large scale, giving distribution of trees and classification of lands. There is also a forest map of Indian Territory and a map of the pine lands of Minnesota. Mr. Henry Gannett is the author of the first paper, or summary of the year's operations. He gives an interesting table showing the years required for the various species to increase in diameter one inch on the various reservations. In a few cases there is such increase in less than four years, as, for example, the spruce, on the north and west sides of the Olympic Mountains and the Cascade Range, Washington; the Western White pine, Mount Rainier Reserve; and the redwood of Smith River, California. The redwood shows the most rapid growth of all. The slowest growth is found with the lodgepole pine, or tamarack, Colorado, and the whitebark pine and Patton spruce, Mount Rainier Reserve, the period for one inch of increase ranging from 11.7 to 14.5 years. The average for 55 cases, belonging to 16 species, is one inch in about seven years. In general, environment, more than species, determines the rate of growth.

The maps of the reserves afford an interesting study, and they may be cast into a few groups as an aid to the memory. We may distinguish a Washington-Oregon group, including the following reserves—the Olympic, Washington, Mount Rainier, Bull Run, Ashland, and Cascade Range. These aggregate 17,519 square miles, or about twice the area of Massachusetts, and all but the first lie in a nearly north and south belt along the Cascade Range. The Olympic Reserve is in the heavily-watered regions between Puget Sound and the Pacific Ocean. The reservations of the California group are: Lake Tahoe, Stanislaus, Sierra, Pine Mountain and

Zaca Lake, San Gabriel, San Bernardino, Trabuco Cañon, and San Jacinto. The first three follow the Sierran Range in eastern California, and the others make a northwest by southeast belt in the southern part of the State. The total area is 13,606 miles. The following make up the Arizona-New Mexico group: Grand Cañon, San Francisco Mountain, Black Mesa, Gila, Prescott, and Pecos River. All but the last two compose a belt stretching from the Colorado River to the southeast.

In the Colorado-Utah group we have: South Platte, Plum Creek, Pikes Peak, Battlement Mesa, White River, and Uinta, all but the last in Colorado. In Idaho, Montana, Wyoming, and South Dakota the reserves lie widely scattered, as follows: Priest River, Flathead, Lewis and Clarke, Bitterroot, Teton, Bighorn, Black Hills, and Yellowstone. The last lies on the east of the Yellowstone National Park, and the Rainier Reserve entirely surrounds the Mount Rainier National Park. The Yosemite National Park lies between the Stanislaus and Sierra Reserves. All the national parks and forest reserves are west of the 103d meridian. The total area of the reserves is 70,251 square miles.

Much of the volume is given to detailed township descriptions, but several passages are believed to have general interest. Thus the Lewis and Clarke Reserve in Montana is described by Mr. H. B. Ayers. The pines are of five species, and the forests include Engelmann and white spruce, two larches, two firs, two hemlocks, balsam, cedar, cottonwood, aspen, and balm of Gilead. This paper, like the others, is abundantly illustrated with good photographs. The reserve is estimated to contain 2,644,360,000 feet of timber. Relatively, little has been cut, mainly by ranchmen, and for the railways. An area of 1,420 square miles, nearly one-third of the reserve, has been severely burned in recent times. Here reforesting is postponed 100 years or more, owing to the loss of shelter and of the humus layer. Patrol was so effective that no fires occurred in 1899. Various other geographic data are given relating to soil and agriculture, irrigation, water-power, transportation, and mining.

Minute examination has been made of the Olympic Reserve. Here is much good land, but too inaccessible to repay the cost of clearing the timber. The heaviest forests in Washington, rarely surpassed in the United States, occur in this reserve. The average amount of timber is 24,000 feet per acre. Hemlock leads, then red fir, silver fir, cedar, and spruce. Little lumbering has been done, the rivers being too swift and variable for convenient log-driving. The mountains reach up to 8,000 feet, and grazing lands abound on the

high slopes and ridges. There is no railway in the reserve, but a practicable route would follow the coast, with spurs leading up the valleys to the timber lands. Six maps in the case show the distribution of various sorts of trees in the reserve.

The Cascade and Ashland Reserves lie about equally on the east and the west slopes of the Cascade Range. This range is, in general, a plateau, furrowed with gorges and bearing volcanic cones. Crater Lake is here the notable representative of a group of lakes. As a rule, the region is wet on the west and drier on the east, with local modifications and exceptions. Yellow and lodgepole pine form 88 per cent. of the forest on the east slopes, and the broad-leaved trees but a fraction of one per cent. On the west the latter sort rises to six per cent. of the entire forest, which is thus heavily coniferous.

A passage of great interest in this section of the report discusses forest fires. There is no forested township in this reserve in which the timber is not somewhat fire-marked. Only 25,000 acres out of 3,000,000 have escaped. Some of the fires belong to the period of Indian occupancy, but by far the greater fires, and in greater number, have occurred since the coming of the white man. But, on the other hand, it is encouraging to observe that fires have become far less common during recent years. This diminution is due to the extinction of game and the smaller number of hunting parties, to private ownership of timber and better precautions, and to the destruction of the humus layer by earlier fires, so that it is not now present as a means of spreading them.

The Indian's reasons for setting fires were: that grass might grow near his camps and that he might destroy undergrowths and facilitate hunting. In some cases he may have sought the after-growth of huckleberry and blackberry thickets. The white man has fired the woods also for various reasons, or in various ways: as to attract game, to open roadways, to promote grass-growth, and through careless leaving of camp-fires. One case is cited in which fires were started to attract game. Half a dozen deer were obtained, and 15 to 20 million feet of merchantable timber were destroyed, the fire raging until put out by the fall rains. One fire was set to remove a windfall log from a road, and 3,000 acres of timber were burned. In some cases the soil, almost purely vegetable in constitution, is completely burned away, leaving the bare lava rock. In such cases many hundred years may be required to replace the soil and renew the forest. Another result is a great increase in the rate of denudation of the light, easily-moved pumice that in

some parts forms the surface rock. This is cleaned down to the impervious rock beneath, thus removing an important spongy reservoir of the surface waters, insuring rapid run-off, and tending to produce desert conditions.

Another result of fires is a change in the composition of the forest, due to greater evaporation, less soil moisture, and the consequent dominance of trees suited to a drier soil. Thus, lodgepole pine replaces hemlock and fir. In some such cases reforestation by the pine brings back the soil moisture, and the hemlock and fir begin to regain their ancient grounds.

The yellow pine is considered to be the most resistant to fires of any tree on the Pacific Slope. Veteran trees of this species do not suffer from repeated fires, though the seedlings perish. White pine and lodgepole pine have thin bark and resist fires poorly. The same is true of the Alpine hemlock. About 20 per cent. of the fire-marked timber is "badly burned," this meaning a loss of 75 per cent. or more of the mill timber. The heaviest-timbered areas suffer most from fires. In the Cascade Reserve the fire loss, not including clearings for cultivation, has in the last forty years amounted to seven thousand million feet of mill timber.

In the report on the Stanislaus and Lake Tahoe Reserves a list is given of the sequoia, or big-tree groves, in California. They are eleven in number, containing from half a dozen trees to several thousand each. Names are given of the individual trees in Calaveras and Stanislaus Groves. Taking 30 of these sequoias, the height ranges from 235 to 315 feet, and the diameter six feet above ground is from 9 to 19.5 feet. The majority of the trees are believed to be under 2,500 years old, though the writer seems to agree with John Muir in conceding a greater age, even up to 4,000 years, for certain individuals. At two points in the Stanislaus forest reproduction is going on, but nowhere in the Calaveras group. In the former are dense patches of seedlings and saplings. The seedlings are from 2 inches to 4 feet high, and the saplings range from 10 to 30 feet. There is believed to have been no reproduction in the Calaveras Grove for forty or fifty years, as there the smallest sequoias are from 18 to 24 inches in diameter.

The waste of timber in these reserves is due to shake-making and lumbering. The shake-maker sought the straight, easily-splitting trunks, especially of the sugar pine, leaving enormous masses of top to rot or to increase the intensity and facilitate the spread of fires. Much the same is true of lumbering, great parts of the

upper trunk being wasted which would be worked up in eastern lumber districts.

Sheep-grazing is more destructive than cattle-grazing, and there is a conspicuous absence of seedlings and larger undergrowth where the forest ground has been too closely occupied by herds and flocks. A great number of forest fires are also chargeable to sheep-herders. Some result from carelessness, and others are set to clear away logs and facilitate movement of flocks on their return—a most wanton procedure, requiring effective repression. The forest ranger may warn such trespassers to leave the ground, but he is likely to receive the answer that "bullets alone will be obeyed." Many trees are badly scarred, or even felled, by burrowing fires that persist on account of the resin in the wood. Shake-makers often chip the trunks to see if the grain is straight. The resin exudes and runs to the ground, the fires follow it up the trunk, and enlarge the scar from season to season, fed by the resin that accumulates in the intervals. Fires show surprising persistence in the green wood, and this accounts for the hollowing out of great trunks in that region. Sheep-rangers are found to be much more responsible for fires than cattle-herders. Milling operations cause many fires—some deliberately set to open roads, others catching from donkey loading engines. Few are due to campers and hunters, partly because such camping is usually near roads and settlements and partly because the game is nearly exhausted.

Public sentiment in the region is opposed to Government forest reservations. But many of the protests and the more violent objections come from grazers and other interested parties, and they should be taken for what they are worth.

The last paper of the Report deals with the pine region of Minnesota, and is accompanied by a somewhat detailed map, showing land and forest classification. Some of the statements regarding timber losses by fire are startling. The author quotes Professor Winchell's estimate that "annually ten times as much pine is destroyed in the State as is cut by all the mills. The State has lost in this way more than as much pine as now remains." In fourteen townships 836 million feet are known to have been burned—a loss of $240,000 to each township. Fire protection has accomplished much, but is unduly subject to local influence, and is yet imperfect. There is danger that the fears aroused by the great fire of 1894 will subside, and that suitable precautions will not be taken against the next very dry season that may occur.

NOTES ON GEOGRAPHICAL EDUCATION.

BY

RICHARD E. DODGE.

GEOGRAPHICAL EDUCATION IN BRITAIN.—In his annual presidential address to the Royal Geographical Society in May last, Sir Clements R. Markham devotes a large amount of attention to the need for better geographical education in all stages of educational work. Hitherto the argument for better and more geography in English preparatory schools has been largely based on the unappreciated culture, discipline, and practical value of the subject. In the address noted especial and first emphasis is given to the necessity of better-ordered geography work, in order that research in field or in the study may be advanced. In other words, the schools are not laying the necessary foundation for University and post-graduate work in geographical investigation.

The reason for this unfortunate condition is wisely found in the fact that the schools have few teachers who are versed in the elementary principles of the subject.

This plain statement is closely akin to the argument frequently made by Professor Davis and others in this country, that the number of teachers teaching elementary geography who have had any training more advanced than that they are giving to their pupils is small. In Britain and America the conditions seem to be very much the same. The universities must finish better-prepared teachers for the secondary schools, and the secondary schools must in the same way aid the elementary schools. Then, in the course of time, better-prepared pupils will come up to the universities demanding advanced and more inclusive geographical opportunities.

President Markham also gives an enlightening summary of the geographical changes, either incorporated or about to be incorporated, in the Universities of Paris, Oxford, and London. From this summary it appears that geography has been given an important and independent place in the University of Paris, and that more than $10,000 has recently been expended in equipment and in a laboratory. Geography has been advanced in importance to such an extent that it may be taken for the Doctorate.

In the University of London geography has been made a com-

pulsory subject for the degree of B.S., and opportunities will be offered, so that

> it will be possible for a geographical student in this country to follow his subject through all the stages of the University course, from matriculation to the doctor's degree.

Because of this, and other advances noted in the address, President Markham is extremely optimistic as to the future development of geography in Britain. He feels that the efforts made under the lead or guidance of the Royal Geographical Society for more than thirty years are at last bearing rich fruit, with a promise of better results each year.

PROGRESS OF GEOGRAPHY IN THE SCHOOLS.—In Part II of the First Year Book of *The National Society for the Scientific Study of Education*, Professor W. M. Davis of Harvard University has published a paper entitled "Progress of Geography in the Schools." In the early part of the paper, Professor Davis emphasizes the necessity in this country of a more efficient organization of geography in the colleges and universities, that the inspiration of higher ideals may react upon the secondary and elementary schools. He then shows how the subject should be ordered and classified in all lines of work in order to produce better mental discipline as a result of its study by pupils of all ages. The paper, as a whole, deserves careful reading by all teachers, especially by secondary teachers, for whom it seems to have been especially written. It is one of the strongest and best-substantiated arguments for scientific geography in schools that have recently appeared in this country.

The following paragraphs present certain helpful suggestions of value to all geography teachers:

> *Replacement of items by generalities.* The hopeful progress that school geography has made in the last twenty years is characterized largely by a diminution in the number of isolated empirical items to be committed to memory, and by a corresponding increase in the number of principles and generalizations to be intelligently studied. There is no reason for thinking that this progress has reached its limit; there is, on the other hand, much ground for believing that, as the teachers and the teachers of teachers of geography gain a larger and broader understanding of the subject in its mature development, the replacement of the lonesome empirical item by the rational category, under which the items are grouped in good fellowship, will continue to increase beyond its present moderate measure. Items must still be presented in abundance, for young pupils need plenty of specific information; but the items should be introduced in illustration of the categories to which they belong, rather than as sufficient unto themselves. In the earlier years of school study the items ought to precede the category and the generalization, for first progress must be largely inductive; but by the time the high school is reached, and probably for a year or two sooner, deduction may be used to a significant extent; that is, the generality

may be presented first, and the items may then follow as deductions from it, instead of preceding as elements of its induction. Many teachers are already using the deductive method in teaching the distribution of wet and dry regions as determined by the relation of mountain ranges to the terrestrial wind system; and the success of the method there testifies to the success that may be expected in other cases where the mental processes involved are of a simple and safe order. This matter deserves more emphasis and amplification than I can give it here; suffice it to say that geography will become more and more a scientific method, which always involves deduction along with induction in treating problems where any of the essential facts are unseen.

As geography becomes rational the purely *memoriter* method will hold lower and lower rank in lessons. Such a topic as State capitals, learned in old-fashioned days as a monotonous recitation, may be enlivened by an enlarged treatment, in which many other facts than mere name are associated with the capital city. Many of these peripheral facts may be forgotten, but the central fact will remain more firmly fastened in the memory than if it had but one empirical attachment. So with State boundaries; the mere recitation of boundaries, apart from the geographical relation of the boundaries, is dull work; dull in the book, dull in the teacher, dulling in the pupil. Instead of having such matters learned as mere feats of unreasoning, unassociated memory, they should always be combined in a rational way with other things, so as to make for intelligence, and to develop in the pupil the habit of looking for the meaning of things, instead of dulling, or even repressing, that excellent habit. When rivers are taught only by name and place, it must be that little more is said about them in the textbook and known about them by the teacher. It is very questionable whether it is worth while to use any share of school hours in learning so slender a geographical item as the mere name of a river. It would be much better to omit altogether the account of a country that is thus treated in earlier school years, and to take it up, for the first time, when its general geography is treated in such a manner that mountains, climate, rivers, products, and cities are properly associated. It is well known that the best schools are making excellent progress in such lines as these; but it is not yet time to flatter ourselves that pressure toward such progress is unnecessary.

Geographical facts must be made more real. I recall the true story of a little girl learning her lesson in a question-and-answer geography. *Ques.* "Do the stars shine by day as well as by night?" *Ans.* "They do." The little victim was seen rocking herself to and fro, as if to give even a muscular aid to her memory, and repeating, "They do, they do, they do—they do, they do, they do." The theory of teaching has far outgrown such absurdities, but the practice has not, and we must continue to protest against them. I have in my own experience seen members of a class of teachers try to answer the question: "Why are the days longer than the nights in summer?" by recalling the words from some printed page, instead of by attempting to visualize the plain facts of nature. The moral of this is that the facts of geography must be made more real than they can be by studying only the words of a book. All sorts of observational devices must be summoned to the aid of the printed page. The importance of this principle will be more fully realized when it is recalled that children can know much more than they can say; that their power of observation is far greater than that of expression; and that equality of these two powers is not always reached even in mature minds. In order, therefore, that the little that young pupils can say about geography should be properly proportioned to their whole mental acquaintance with the subject, they should be provided with material, especially with material for observation, in much larger quantity than they are expected to re-

cite, and in much more realistic form than mere names and definitions of unknown things.

Yet such is our servitude to conventional methods that we constantly fail to teach by things; the teaching by words is so much easier. Consider, for example, the rotation of the earth. What is simpler than to observe in an effective manner the elementary facts upon which the extraordinary conclusion is based? And yet how few school children ever learn these facts by well-directed observation before they learn the verbal statement of the conclusion printed in a text book. There is no inherent difficulty in having the necessary observations made by school children at different hours during a two-session school day; particularly that most significant observation, that on the second day the sun can be seen to approach, from the eastern side of the sky, the position that it had in the sky twenty-four hours before. Again, with latitude, in how many schools of our country are the necessary facts taught by observation before the terms are introduced and definitions are memorized? Yet here induction is surely the safe and sound method. I am convinced that the vagueness of popular understanding about things of this kind comes from an over-emphasis of verbal definitions in school years, while facts easily observed are under-emphasized. It would be well to replace the names, diameters, and distances of the planets—matters of small geographical import in any case—with the observational proof that there are planets—other earths—to be seen in the sky, and that young observers can easily follow them among the stars. All these errors of method would be reduced or excluded if the teachers were perfectly easy-minded on such problems; and the easy mind is gained through practical acquaintance with observational methods such as should characterize the more mature stages of geographical study.

Geography indoors should be as largely as possible supplemented by outdoor observations by the pupils; yet I have found a great diffidence among teachers as to outdoor observation, even on their own part. They may have learned very well, indeed, everything that a book has to say about the origin of valleys; they may profess a belief in the destructive work of the streams that flow through the valleys; yet, when it comes to taking a class of children outdoors and using the examples of geographical forms, such as the neighbourhood affords, there is too often an undue hesitation. The teacher's lack of self-confidence would be greatly diminished if her own school work had been more liberally guided, and if her days of professional preparation had been spent in the consideration of a decidedly more mature phase of geography than that on which her skill is afterward to be exercised.

M. FROIDEVAUX'S PARIS LETTER.

PARIS, Sept. 16, 1902.

The thirty-first annual session of the French Association for the Advancement of Science was held at Montauban, in the first fortnight of August. On reading over the list of communications it seems as if the efforts of M. Gauthiot, the President of the Geographical Section, had met with but indifferent success, and that the geographical papers of real interest were presented in other sections. M. Stanislas Meunier treated the Formation of the *avens* in Caverns and in Passages turned to account by the underground circulation of water; M. de Grossouvre, the Distribution of Coal Measures in the western part of the Central Plateau; M. Bailland discussed the Climate of Toulouse from observations recorded for the period 1864–1900, and M. Marchand presented a study of the height and of the constitution of the clouds in the region of the Pyrenees. A geological map of the southwestern border of the central massif, on a scale of 1: 200,000, was shown by M. Thévenin, and M. Turquan offered a luminous statement of the movements of population in the Garonne basin, illustrated by a number of interesting maps. When the Compte-Rendu is published I shall take up the most important papers of this Congress and present their conclusions. I shall do the same for the Congress of the Navigable South-West (held at Bordeaux, June 12–14), devoted to the serious study of the internal navigation of South-western France in past time, and especially throughout the course of the XIX century. There may also be occasion to take up some of the communications addressed to the *Congress of White Coal*,* which has just been held at Grenoble, and is not less interesting from an economical than from an industrial point of view.

In June and July a cartographical, ethnographical and maritime Exposition was held at Antwerp by the Geographical Society in commemoration of its 25th anniversary. Worthy of note were the maps showing the variations in the Scheldt at Antwerp, the relief maps of M. Ch. Péron, the globular maps of M. Elisée Reclus, as well as the scientific exhibits of Capt. Lemaire's explorations in Katanga and the work of the *Belgica* staff in the

* White coal (La Houille Blanche) is an accepted expression for glaciers, considered as storehouses of energy.

Antarctic. With these were shown the results of the latest explorations of the Dutch in the interior of Borneo and in Guiana, specimens of surveys and itineraries from the various expeditions of Savorgnan de Brazza in the Congo country in the period 1875–1885, a very interesting unpublished survey of the course of the Alima by the regretted Dr. Ballay, portions of the itineraries of the Marchand Mission from the Atlantic to the Red Sea, and of the Gendron Mission to the French Congo. Among the ethnographical collections were those brought by M. Albert Courboin from the River Jurua, in Brazil; others from Surinam; one relating to the Congo Free State, exhibited by the Museum at Tervueren, near Brussels, and the collections made by the missionaries of the Sacred Heart at Borgerhout in British New Guinea, in the Louisiade Archipelago, and in the Ellice and Gilbert Islands, and particularly in the valley of the St. Joseph River (New Guinea), where the inhabitants are still unacquainted with the use of iron.

The historical portion of the Exposition was not less attractive than the display of recent work. The museums and libraries of the Netherlands contributed their stores of manuscript and printed maps and charts of the Dutch discoveries on the coasts of Russia and the Frozen Ocean, in the New World, in the East Indies, in Australia, and in the Pacific Ocean; and with these were accounts of voyages, portraits of explorers and colonizers, curious models of old ships, original documents and facsimiles, together with a considerable series relating to Mercator and Ortelius, souvenirs and productions of P. F. Verbiest, and of the Jesuit Mission in China in the XVII century.

Of recent explorations one of the most striking is the raid of Lieutenant Cottenest from In-Sala to the south of the Hoggar massif, a distance of more than 370 miles; passing by the Muydir Plateau and Tifedest, this young officer entered the spurs of the Saharan massif, first toward the east, then, after rounding its southern extremity, towards the west, where he was attacked by the Touareg, whom he repulsed, and recaptured from them the canteens and two muskets belonging to the Flatters expedition and the tent of the Marquis de Morès. In Dahomey, Lieut. Tilho has done some topographical work which fills up part of the blank in the map of the Dahoman Niger and extends our knowledge of the inhabited part of Dendi and the circle of Say. M. Roubaud, who succeeds Lieut Tilho, proposes to continue his geographical work, with which must be mentioned the surveys made by Lieut. Drot in Bedu and the Bargu territory and the studies of the Toutée party

in the settlement of the boundary between Dahomey and northern Nigeria. In the third military Territory, Col. Peroz has directed surveys which enable Capt. Moll to draw a general map of the whole country from the Niger to the neighbourhood of Lake Chad, including Damergu and the sultanate of Zinder.

Farther south Capt. Löfler made, in 1901, important reconnaissances from the Sanga to the Shari and the Benue, substituting for the previous vague accounts of the region precise information concerning the relief of the surface, the distribution of the water courses, and the ethnography. In the curious granitic massif of the Tari, reaching an elevation of nearly 3,000 feet, he recognizes a portion of an uplift extending from west to east between 5° 50′ and 7° N.—an uplift which he himself observed on the Kamerun frontier and prolonged towards the east in the rocks of the upper Gribingi, the Kagas of M. Bruel; and in the Wahme-Wa Bahr Sara he sees (in opposition to M. Gentil) the principal branch of the Shari. His exploration of Lake Tuburi and the Mayo Kebbi has enabled him to confirm the existence of depressions formerly observed by Nachtigal and later by C. Maistre, and to declare:

1°. A vast depression, through the whole length of which is strung, even in the height of the dry season, a chain of ponds and large lakes, exists between the Logone and the Benue;

2°. In the rainy season all these waters flow together and form a single great sheet, on which the boats ply between the two great rivers;

3°. In this way Lake Chad, in the rainy season, is brought into direct communication with the sea.

In Ethiopia the mission headed by the Viscount du Bourg de Bozas undertook, in 1901, the scientific exploration of the plateaux in southern Abyssinia, inhabited by the Arusi Gallas. The country between the Wabi Shebeli and Guigner (sometimes called Ginea) was discovered, the Webi (or Webb) was traced for 150 miles to its source, the Badda plain was examined, as well as the almost uninhabited region of Boke, and a portion of the Awash, hitherto unknown. In addition to these geographical results the du Bourg de Bozas party gathered many geological, botanical, ethnographical, and other facts of scientific interest. It is now continuing its researches in Kaffa.

We have but scanty reports of the Duchesne-Fournet mission, which reached Addis-Abeba by a route the topography of which was little known. The itinerary of the party was laid down with great detail across the Gurgura, Somali, Dankali, and Itu countries, the middle region of the Awash, and the Kassam basin. From Addis-Abeba the mission went to the north.

The work of M. Guillaume Grandidier, in his crossing of southern Madagascar, is summarised in *La Géographie.* Some unknown regions, such as the environs of Cape St. Mary and Lake Tsimanampetsotsa, have been surveyed, and the exploration has done away with a number of local legends and established the fact that the country, though arid and uncultivated, has a somewhat dense population and contains riches hitherto unsuspected. A map on a scale of 1:1,000,000 accompanies M. Grandidier's article.

Father Colin's studies of the central massif of Madagascar are continued in the *Comptes Rendus* of the Academy of Sciences, and must be noted, as well as Dr. Percheron's researches in the geology and natural history of the Great Comoro.

Among the French travellers in Asia, M. E. D. Levat is on his way to Bukhara and Turkistan to investigate the geology and particularly the records of glacial action in those countries. M. Paul Labbé has left Sakhalin and Transbaikalia for the provinces of Irkutsk and and Yenisei, where he will study Shamanism.

In Indo-China there has been constituted a permanent scientific commission for the study of the natural history, the geology, and the anthropology of the colony.

In Polynesia M. Seurat continues his scientific work. He has lately discovered syenite in Tahiti.

In the New World the volcanic phenomena at Martinique have been studied by a commission, composed of Messrs. A. Lacroix, mineralogical professor in the Museum of Natural History, Rollet de l'Isle, hydrographical engineer, and Jean Giraud, doctor of science. These gentlemen, on their return, addressed two notes to the Academy of Sciences—one on the observations of the eruptions of the Montagne Pelée, the other on the catastrophe which overwhelmed the City of St. Pierre. From their examinations it appears that on the 6th of July last the summit of the volcano was 1,357 metres (4,452 feet) in height. It had not, therefore, fallen in, and the topography of the upper valleys (with the exception of modifications produced in the very neighbourhood of the crater) has undergone no serious change.

If the mountain stands out to-day, *with the hardness of a relief map, enhanced by erosions of the surface*, this is due to the total disappearance of the tropical vegetation which formerly covered the valleys and partly hid their deep ravines.

On the other hand, the topography in the lower portion of the valleys of the rivers Sèche and Blanche has been completely subverted by the avalanches of mud that fell on the 5th of May.

Neither the shore nor the sea bottom appears to have suffered any change. In his second note M. Lacroix indicates the cause and the successive phases of the catastrophe; he shows that the blast of incandescent gases which destroyed Saint Pierre issued from the very top of the mountain, and he records an extension and a displacement of the region of danger. M. Lacroix goes back to Martinique to examine the effects of the later devastation and to establish around the volcano posts of observation, from which the people of Fort-de-France may receive timely warning by telephone of any threatened eruption. On his return he will report his new observations and take up the study of the materials collected by his associates and by himself.

Of geographical literature I shall do no more than mention the work on Irrigation in the Iberian Peninsula and in North Africa by M. Jean Brunhes, M. E. Gautier's Study of the Physical Geography of Madagascar, and Col. Berthaut's History of Military Geographical Engineers; and at the same time call attention to the paper by M. Brunhes recently submitted to the Academy of Sciences—an essay towards the classification of the gorges hollowed out by water-courses. This is based on the existence in the walls of the gorges of continuous surfaces, presenting the hollow, egg-shaped forms which are the unmistakable remains of ancient giant-kettles. M. Maurice Lugeon has verified the frequent occurrence of the metamorphic gorges in the Alps and the existence of calcareous bars in some of the Swiss valleys; and the excellent notes on the Geomorphogeny of the Dauphinese Alps, by M. Kilian, in *La Géographie* for July, treat the same order of facts. M. Marc Le Roux's Guide to Upper Savoy is to be noted as the best popular description of that region.

Of a different kind is M. Jean Giraud's thesis, *Études Géologiques sur la Limagne* (*Auvergne*), which defines the limits of the depressions formed in this plain at different epochs, and, in particular, the geosynclinal of the northern Limagne, advances new facts to sustain the hypothesis establishing the relations of the southern Limagne with the valley of the Rhone, and notes new eruptive phenomena during the Miocene.

It is not too late to call attention to the article on *L'Érosion Pyrénéenne et les Alluvions de la Garonne*, by M. L.-A. Fabre, published early in the year in the *Annales de Géographie*, and supplemented by an interesting note on Pyrenean Magnetite in the sands of Gascony in a recent number of the *Bulletin de Géographie Historique et Descriptive.*

The distribution of the days of frost in France has been studied

by M. C. Passerat; and, in another paper not less interesting, in the *Annales de Géographie*, the subject of the rainfall in the plain of northern France is treated. Notwithstanding the nearness to the sea, the precipitation is lighter in the plain and comparatively heavy on the elevated ground.

M. Ginestous has described the rains of Tunisia in a memoir published by the Meteorological Service. In *La Revue Coloniale* appear some extracts from the report of Father Trilles on his exploration of the Fan country (French Congo), in company with M. Lesieur in 1899–1901. These show that all that portion of the Northern Congo recently contested between France and Spain is covered by the great equatorial forest, which extends from the Atlantic to the banks of the Congo, and that the plains indicated on the map have no existence.

M. C. Maistre, well known by his expedition from the Congo to the Niger, in 1892–1893, has an admirable account of the Bahr-Sara region, which should be read with Capt. Löfler's report, already mentioned.

A few lines must be given to some recent works on historical geography, all relating to the New World. One is M. Henry Vignaud's communication to the Americanist Congress of 1900 on the Letter of Toscanelli to Fernam Martins and to Christopher Columbus. At the head of this memoir, which states concisely and with vigour the conclusions reached in his work, *La Lettre et La Carte de Toscanelli*, M. Vignaud replies to three of his critics, Messrs. G. Uzielli, Hermann Wagner, and L. Gallois.

Another important document, somewhat too briefly expressed, is the paper by M. Gonzales de la Rosa, entitled "The Solution of all the Problems relating to Christopher Columbus, and, particularly, that of the Origin of the alleged Inspirers of the Discovery of the New World."

M. Gabriel Marcel has brought out an excellent study, at once very new and very amusing, and fortified with documents, on *Les Corsaires Français au XVI^e^ Siècle dans les Antilles;* and Dr. E. T. Hamy furnishes in the *Bulletin de Géog. Historique et Descriptive* new information on the voyages of Capt. René de Laudonnière between 1561 and 1572.

In this way we are advancing, little by little, towards a more complete and more precise acquaintance with the period which is the most fruitful, and perhaps also the most obscure (in spite of the numerous studies of which it has been the object), in the whole history of the Discovery.

HENRI FROIDEVAUX.

ACCESSIONS TO THE LIBRARY.

JULY–OCTOBER, 1902.

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La Solution de Tous les Problèmes relatifs à Christophe Colomb, et, en particulier, de celui des Origines ou des Prétendus Inspirateurs de la Découverte du Nouveau Monde. (Extrait du Compte rendu du Congrès international des Americanistes, 1900.) Paris, E. Leroux, 1902. 8vo.

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Great Trigonometrical Survey of India: Vol. XVI, Details of the Tidal Observations, 1873–1892, etc., by J. Eccles. Dehra Dun, Survey of India, 1901. 4to.

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National Register of the Society Sons of the American Revolution. Compiled, etc., by Louis H. Cornish. New York, Sons of the Am. Revolution (1902). 8vo.

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The Northern Territory of South Australia: A Brief Historical Account, etc., by the Hon. J. Langdon Parsons; and The Capabilities of the Northern Territory for Tropical Agriculture, by Maurice W. Holtze. *Papers read before the Royal Geographical Soc. of Australasia, South Australian Branch.* Adelaide, 1901, pr., 8vo.

From H. W. Rankin, New York:

Two half-tone portraits of Dr. Divie Bethune McCartee, from photographs taken in Tokio and New York.

From Anson Phelps Stokes, Author, New York:

Cruising in the West Indies. New York, Dodd, Mead & Co., 1902. 8vo.

DECISIONS OF THE U. S. BOARD ON GEOGRAPHIC NAMES, OCT. 1, 1902.

BLACKMAN: stream, flowing from Chemo Pond, Penobscot County, Maine. (Not Chemo nor Nichols.)

CALABASAS: arroyo, peak, P. O. and township, Los Angeles Co., California. (Not Calabazas nor Calabaces.)

CHAPARRAL: gulch, P. O. and R.R. station, Yavapai Co., Ariz. (Not Chaparal.)

CHEMO: pond, Penobscot Co., Maine. (Not Nichols.)

CHESTATEE: militia district (Lumpkin Co.) and river, Georgia. (Not Chostatee nor Chosteta.)

CHOCOWINITY: bay, creek, P. O. and Township, Beaufort Co., N. C. (Not Chockowinity.)

CONETOE: creek in Edgecombe and Pitt counties, P. O., R.R. station and two townships (Upper and Lower) in Edgecombe County, N. Y. (Not Coneeto, Coneto, Congeto, nor Keneighton.)

CONOHO: creek, P. O., R.R. station and village, Martin Co., N. C. (Not Coniho nor Goose Nest.)

ELKAHATCHEE: creek in Coosa and Tallapoosa counties, Ala. (Not Elkehatchee nor Elkhatchee.)

INDIAN GUYAN: creek in Gallia and Lawrence counties, Ohio. (Not Guyandotte nor Indian Guyandotte.)

LATTINTOWN: P. O. in Marlboro, Ulster County, N. Y. (Not Lattingtown nor Latintown.)

MALIBU: creek, land grant and point, Los Angeles Co., California. (Not Malaga, Malibo, Topanga Maliba Sequit, nor Topanga Malibu Sequit.)

PADELFORD: creek, P. O., R.R. station and village, in Canandaigua township, Ontario Co., N. Y. (Not Paddlefords.)

POWELLS: P. O. and R.R. station, Marion Co., W. Va. (Not Powell.)

ROQUIST: creek and pocoson (swamp), Bertie Co., N. C. (Not Rocquist, Roquest, Roquewhist, nor Rakwis.)

NOTE.—From the Catawba word *Rakwis*, meaning turtle.

ROSIER: cape, Penobscot bay, Hancock Co., Maine. (Not Rozier.)

SIQUIS: arroyo or creek, Los Angeles Co., Cal. (Not Isique, Sequit, nor Siquit.)

SOQUE: P. O. and river, Habersham Co., Ga. (Not Sookee nor Soquee.)

STEVENSTON: P. O. and R.R. station, Warrick Co., Indiana. (Not Stephenson, Stephenston, Stevans, nor Stevens.) Named after Judge Stevens.

SWARTE: kill, Ulster Co., N. Y. (Not Black, Croziers, Swarts, nor Swartz.)

SYMMES: creek, Gallia and Lawrence counties, Ohio. (Not Simms.)

TESNATEE: creek, gap, militia district and P. O., White Co., Georgia. (Not Tesnata nor Tessantee.)

TOPANGA: cañon, Los Angeles Co., Cal. (Not Tobanao, Tobanca, nor Topango.)

TRANTERS: creek, forming part of boundaries of Beaufort, Martin and Pitt counties, N. C. (Not Trantus.)

UNICOI: gap and turnpike, White and Towns counties, Ga. (Not Unicoy.)

MEMORANDA FROM THE U. S. GEOLOGICAL SURVEY.

TOPOGRAPHIC MAP sheets of New York State recently issued are: In central New York the Palmyra quadrangle, which includes portions of Wayne and Ontario counties, in the region surrounding and north of Palmyra and Newark, N. J.; and the Geneva quadrangle, showing the country in Seneca and part of Ontario counties bordering the foot of Seneca and Cayuga lakes and embracing the cities of Geneva, Waterloo, and Seneca Falls. In the Adirondack region the Wilmurt quadrangle, consisting of adjoining portions of Herkimer and Hamilton counties in the mountainous section drained by the West Canada Creek; and the Indian Lake quadrangle, showing Indian Lake and a number of other smaller bodies of water. In southern New York the eastern portion of Orange County, with the city of Newburgh, is represented in the Schunemunk quadrangle, which takes its name from the Schunemunk Mountain—a conspicuous topographic feature; this map shows most of the fertile dairy country east of the line of the Lehigh and Hudson River Railroad. The Millbrook quadrangle represents the northern portion of Dutchess County, adjoining the Connecticut line; on it are represented all the towns and physical features of the valleys of the Tenmile River and the Webatuck and Wappinger creeks, and those of the intervening country from somewhat south of Millbrook to Pine Plains and Mt. Riga.

The maps are all drawn on a scale of about 1 inch to the mile, and cover rectangular sections of country equal to 1.5 degrees of latitude and longitude. The region in the Adirondack Mountains including and surrounding Mt. Marcy, the Adirondack Mountain reserve, Keene Valley, and other well-known localities and features is represented on a map known as that of the Mt. Marcy quadrangle. All the roads and trails are indicated, and the mountainous nature of the region, together with the principal altitudes above sea-level.

The White Haven and Bolton quadrangles cover a portion of the country surrounding the northern shores of Lake George and the southern extremity of Lake Champlain. In the Broadalbin quadrangle portions of Saratoga and Fulton counties are included, and the map shows the rolling foothill country lying just north of the city of Amsterdam. The Hudson River and its valley, for a width of 10 miles or more, from Hudson to Saugerties, appear on the Catskill sheet. Each sheet covers about 200 square miles of territory.

THE SOUTHERN APPALACHIAN MOUNTAIN REGION.—The importance of the Southern Appalachians as a source of water supply is shown by the effort to preserve a large part of it as a national forest reserve.

The United States Geological Survey, through the Division of Hydrography, has gathered a mass of information which has lately appeared in its reports Nos. 62 and 63 of the series of Water-Supply and Irrigation Papers. The report has been compiled by Mr. H. A. Pressey, engineer in charge of the hydrographic field work on the Atlantic coast.

Among aspects of the region one of the most impressive is the rapid destruction of the standing timber. Not only is the soil on the steep hillsides left without protection, and soon washed away by heavy rains, but its productive qualities seem to remain for only a few years after the removal of the trees. The destruction of the forest also greatly impairs the efficiency of the streams, which lose their steadiness of flow.

Owing to the numerous steep slopes in the region, many admirable water powers have been found to exist, which may be made of the utmost value to the South as a source of cheap power.

THE NORFOLK QUADRANGLE.—This is a special map formed by combining a number of topographic sheets, previously published, of the country surrounding Norfolk, Va. The section covered by the new map, known as the Norfolk quadrangle, includes Fort Monroe, Newport News, Hampton Roads, Norfolk and Portsmouth, and extends for about four miles south of the North Carolina line; it also covers a large area of the Dismal Swamp. It has been compiled with great accuracy and minuteness of detail, even the houses in the country districts being located on it, and is of more than ordinary interest in indicating the topographic features and the inequalities of relief by a system of contour lines.

A striking peculiarity of the Dismal Swamp is clearly brought out by the map, which shows that the surface of the swamp stands from 7 to 10 feet higher than the surrounding country, and the unusual phenomenon of streams draining out of it in all directions is observed.

The detail of the map is enriched by the addition of ocean soundings and descriptions of the marine bottom.

TEXAS-INDIAN TERRITORY.—The Gainesville Quadrangle is a map of 980 square miles of country, including the greater part of Cooke County, Texas, and an area in the Indian Territory sufficient

to make the total area covered a quadrangle of thirty minutes of latitude by thirty minutes of longitude.

Among other features shown are the exact location of numerous levelled bench marks, with their elevations above sea-level to the nearest even foot, the location of each detached house outside of cities, the principal streets and houses in large cities and towns, the mean magnetic declinations, and on the Indian Territory side of the Red River the location of land survey lines.

FLORIDA PHOSPHATE DEPOSITS.—A report, nearly completed, by Mr. G. H. Eldridge, brings to light a number of interesting features of the Florida phosphate beds. A basement rock of Eocene age, at least 1,000 feet in thickness, was discovered buried under limestones, marls, clays, and sandstones of later date. The phosphate beds are found to lie in a line parallel with the Gulf coast and from 15 to 20 miles inland. Here the limestones, and perhaps some of the marls, have been altered to phosphate and broken down into a mass of boulder-like rocks embedded in clays and sands. They are locally known as "hard rock," and carry from 80 to 85 per cent of phosphate of lime. Another form of occurrence which the phosphate takes is a series of pebbles, probably derived from the hard rock and found in old dried-out lagoons and along river channels in the form of bars. Their proportion of phosphate amounts to from 62 to 75 per cent.

The report will also include a map which will show the position and extent of the phosphate beds and other interesting geologic features. The preparation of this map involved unusual difficulties, owing to the heavy mantle of recent sands, which covers areas of great extent.

MAP OF THE COLORADO CAÑON.—The demand for an accurate and detailed map of the famous Cañon of the Colorado in Arizona has led to a resurvey of this region by the United States Geological Survey, under the charge of François E. Matthes, topographer. The Grand Cañon, formerly reached only by stage route over a desert country, has recently been made accessible by a branch line of the Santa Fé route from Williams, and during the one year that this road has been in operation the Cañon has been visited by thousands of tourists.

The Geological Survey expects to publish a series of atlas sheets covering the entire extent of the Grand Cañon proper and considerable areas of the high plateaux on either side. The first of these

sheets, to be known as the Bright Angel, is nearly completed, and will be available to the public next summer. It includes almost all of the scenery visible from the Bright Angel Hotel, familiar to every visitor. The Colorado River traverses from east to west the quadrangle represented by this sheet, and divides it almost symmetrically. The new map will be on a scale of one mile to the inch, and the contour interval will be 50 feet. It will show every pinnacle, spur, and gully in its true proportions, and each line of cliffs and terraces may be traced along the cañon walls.

The dimensions of the Grand Cañon have been the subject of much discussion ever since it was first explored. It may therefore be of interest to give some figures taken from this new survey. The average width from rim to rim does not exceed ten miles throughout the Kaibab, or widest section of the cañon, and it frequently narrows down to eight miles. The river does not occupy the middle of the gigantic trough, but flows at a distance varying between one and three miles from the south side. Practically all of the magnificently-sculptured pinnacles and mesas (the so-called temples) lie north of the river, and at distances of from five to seven miles from the view points usually visited by tourists. The depth of the Grand Cañon, in one way, has been overstated; in another, understated. Measured from the south rim, the total depth is considerably less than a mile. From the rim at the Bright Angel Hotel, where the altitude is 6,866 feet above sea-level, to the high-water mark of the river at the foot of the tourist trail, the drop is 4,430 feet. The highest point on the south rim at the Grand View Hotel is 7,496 feet, about 4,900 feet above the river. From the north side, however, the drop to the water-level averages considerably over a mile, and in many places even exceeds 6,000 feet. It may be stated that the north rim is from 1,000 to 1,200 feet higher than the south, thus producing that high, even sky-line so striking in all views obtainable by the tourist. The figures here given are based on spirit levels run in connection with the map work. They are the first that have ever been run to the bottom of the chasm, and the high standard of accuracy maintained throughout will cause them to be considered authoritative and final.

NOTES AND NEWS.

THE FIRST MEETING of the Society for the season of 1902–1903 will be held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, November 18, 1902, at 8.30 o'clock, P. M.

Civil Engineer R. E. Peary, U. S. N., will address the Society on his four years' work in the Arctic.

On the 23d of December Mr. George S. Morison, of the Isthmian Canal Commission, will deliver a lecture on the Panama Canal.

THE INTERNATIONAL CONGRESS OF AMERICANISTS held its Thirteenth Session at the American Museum of Natural History in this city in the week of Oct. 20-25. The attendance was large, and the papers read and presented were of unusual variety.

The Fourteenth Session of the Congress will be held at Stuttgart in 1904.

TELEGRAPHIC TIME SIGNALS are now sent out at noon daily, except Sundays and Holidays, by the U. S. Naval Observatory. The Annual Report of the Superintendent for the Fiscal Year ending June 30, 1902, says:

> This series of noon signals is sent continuously over the wires all over the United States for an interval of five minutes immediately preceding noon. For the country east of the Rocky Mountains the signals are sent out by the Observatory at Washington and end at noon of the 75th meridian, standard time, corresponding to 11 A. M. of the 90th meridian and 10 A. M. of the 105th meridian. For the country west of the Rocky Mountains they are sent out by the Observatory at the Mare Island Navy Yard, California, and end at noon of the 120th meridian, the standard time meridian of the Pacific Coast. The transmitting clock that sends out the signals is corrected very accurately, shortly before noon, from the mean of three standard clocks that are rated by star sights with a meridian transit instrument. The noon signal is seldom in error to an amount greater than one or two-tenths of a second, although a tenth more may be added by the relays in use on long telegraph lines. Electric transmission over a continuous wire is practically instantaneous. For time signals at other times than noon, similar signals can be sent out by telegraph or telephone from the same clock that sends out the noon signal.

PROF. GEORGE DAVIDSON, of San Francisco, sends the following note:

> The late Mr. John Dolbeer, of San Francisco, bequeathed the sum of five thousand dollars to the Geographical Society of the Pacific. He had been a director of

the Society for many years, and was cherished as a man of broad and liberal views, and especially devoted to all geographical research. He was much interested in the development of the new territories on the Pacific, and of the surveys of Alaska and the Philippines. His travels had whetted his interest.

A COMMUNICATION from De Bilt, under date of June 9, 1902, announces the formation of a Section of Terrestrial Magnetism and Seismology, under the charge of Dr. Maurits Snellen, in the Royal Meteorological Institute of the Netherlands, of which Dr. C. H. Wind became Chief Director on the 1st of June.

THE

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